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FLORA

OF

THE UPPER GANGETIC PLAIN,

AND OF THE

ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.

BY

J. F. DUTHIE, B.A., F.L.S.,

FORMERLY DIRECTOR OF THE BOTANICAL DEPARTMENT OF NORTHERN INDIA.

RANUNCULACEÆ TO CORNACEÆ.

OFFICE OF

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III

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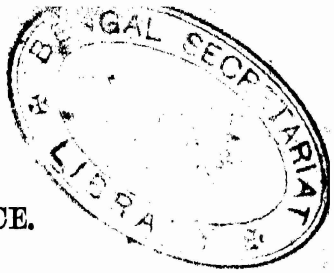
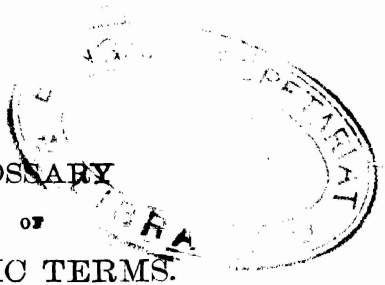


PREFACE.

THE area dealt with in this Flora amounts approximately to 196,000 square miles. It is bounded on the north and north-east by a portion of the main chain of the Western Himalaya, and on the east by Bengal. On the south and south-west the boundary follows the watershed, from which all the rivers west of the Son, and flowing into the Ganges and Jumna from these directions, take their rise. The watershed extends along the northern slopes of the numerous groups of hills known collectively as the Vindhya mountains, and which separate the Gangetic Plain from the Narbada Valley. Mount Abu, a solitary outlier of the Aravalli Hills, and rising to 5,653 feet above the sea, is not included. The area, thus defined, contains the whole of the Upper Gangetic Plain as far as the confines of Bengal, also the Siwalik range of hills, and the Sub-Himalayan tracts from the Jumna to the Gandak. The large piece of country lying to the south-west of the Gangetic Plain proper includes a portion of Bághelkhand in Central India, also Bundelkhand, the Malwa plateau, Eastern Rajputana, and a small piece of the W. Punjab in the neighbourhood of Delhi. In thus attempting to secure a satisfactory geographical area, it was impossible to avoid clashing with political boundaries. It will be noticed, however, on referring to the map, that all the districts of the United Provinces of Agra and Oudh south of the Himalaya are represented. The inclusion of Dehra Dun, as well as of other portions of the submontane tracts of Garhwal, Kumaon and Nepal, may be objected to as being an encroachment on the Himalayan region, but the difficulty was to find any continuous and workable boundary line outside the base of the Himalaya proper. It should also be borne in mind that a writer of a Flora of the Western Himalaya might not be willing to take these particular tracts into his

area; their inclusion, therefore, in this Flora will, at any rate, prevent the risk of their being altogether undealt with.

Volume I carries the descriptions of the natural orders, genera and species to the end of *Campanulaceæ*, and the second volume will contain the natural orders from *Plumbagineæ* to *Gramineæ*, also the index to both volumes. A few remarks on the history of botanical research within the area will be given in an appendix, together with a brief account of the physical features of the country in relation to plant distribution. References to the books consulted, and my acknowledgments to all who have kindly assisted me in the preparation of this Flora will also appear in the second volume. I wish, however, to take the first opportunity of expressing my gratitude to Sir Joseph Hooker for his unfailing kindness and encouraging help during the twenty-eight years I have had the privilege of his friendship; also to my friends Sir George King, late Director of the Botanical Survey of India, and Dr. Prain, his successor, for allowing me free access to the magnificient herbarium and library in the Royal Botanic Garden at Sibpur, as well as for numerous acts of kindness during my frequent visits to Calcutta.



GLOSSARY

OF

BOTANIC TERMS.

THE following list, which is based mainly on Mr. B. Daydon Jackson's very complete Glossary published in 1901, includes also the meanings of several specific epithets mentioned in this Flora :—

Abortive :—imperfectly developed.
Acaulis : without a stem.
Accrescent : enlarging with age, as the calyx of the *Cape-gooseberry*.
Accumbent :—applies to cotyledons which have their edges lying against the radicle, as in many *Cruciferæ*.
Achene :—a hard, dry, indehiscent carpel, as in *Ranunculus* ; also applied to the fruit of *Compositæ*, which is really composed of two combined carpels adnate to the calyx.
Achlamydeous :—applied to flowers, without a perianth, as in willows.
Acicular :—needle-shaped, like the leaves of many conifers.
Acotyledonous :—applied to plants such as *Cuscuta*, which have no seed-leaves or cotyledons.
Actinomorphic :—having flowers of a regular shape, such as may be bisected in two or more planes into similar halves.
Aculeate : armed with prickles like the stem of a rose.
Acuminate : with a gradually tapering point.
Acute : with a sharp-pointed apex.
Adhesion :—the attachment or union with some other organ or part, such as calyx with ovary, stamens with corolla.
Adnate :—used to denote attachment of any organ by its whole length, as anther-lobes to the filament, a stipule to the petiole, or the calyx to the ovary.
Adventitious :—applied to roots which are not formed from the radicle of the embryo ; or to abnormal buds such as are not produced in the axils of leaves.
Aggregate :—applied to flowers in dense heads like those of *Cuscuta Echinops*, etc.; also to carpels as in *Ranunculus*.
Alatus :—winged.
Albumen :—the nutritive substance found in many seeds, and very often surrounding the embryo. *See* Endosperm.
Alopecuroides :—like the tail of a fox.
Alternate :—applied to leaves which are placed one above the other in different vertical lines, also to parts of a flower, as when stamens are placed between the petals, and the petals are between the sepals.

Amphitropous :—said of an ovule when it is curved so that both ends are brought near together.
Amplectens :—embracing.
Amplexicaul :—applied to a leaf or other organ which embraces the stem at its base.
Anatropous :—applied to an ovule which has become inverted, so that the micropyle adjoins the hilum, and the chalaza occupies the opposite end.
Androecium :—a term given to the stamens collectively.
Angiosperms :—plants which have their seeds inclosed in an ovary.
Annual :—applied to plants which germinate and produce flowers and seed and then die within a single season or year.
Anther :—that portion of a stamen which contains the pollen; usually attached to a stalk (filament), or sessile. It is generally composed of two lobes from which the pollen escapes either by slits, valves or pores.
Aphyllous :—without leaves.
Apetalous :—without petals, in which case the sepals often become petal-like as in *Clematis*.
Apocarpous :—when the carpels of a gynæcium are quite free.
Appressed :—applied to a leaf or other organ which lies flat for its whole length against another organ; also refers to hairs.
Apricus :—inhabiting sunny places.
Apterous :—wingless.
Arborescent :—attaining the size of a tree or resembling one.
Arcuate :—curved, or bent like a bow.
Arenarius :—growing in sandy places.
Argentens :—silvery.
Aril :—an expansion of the funicle arising from the placenta, and more or less enveloping the seed.
Arista :—*See* Awn.
Aristate :—Awned.
Armed :—provided with thorns or prickles.
Arrhizus :—without roots.
Articulated :—jointed.
Arvensis :—applied to plants of arable land.
Asexual :—having neither male nor female organs; neuter.
Asper :—rough.
Auricle :—an ear-like appendage to a leaf or other organ.
Awn :—a bristle-like appendage, frequently occurring on the glumes of grasses.
Axil :—the angle formed between the axis and any organ attached to it, such as a leaf.
Axillary :—borne in an axil.

Baccate :—having a fleshy fruit.
Barbatus :—bearded.
Belophyllus :—with arrow-shaped leaves.
Berry :—a fruit pulpy throughout and with the seeds immersed, like a grape.
Bicarinatus :—with two keels.
Biennial :—applied to a plant which requires two years to complete its life-cycle, usually flowering and fruiting during the second year.
Bifarious :—*See* Distichous.
Bifid :—cleft halfway into two.
Bifoliate :—two-leaved.
Bifoliolate :—with two leaflets.
Bilabiate :—two-lipped.
Bipartite :—divided almost to the base into two parts.
Bipinnate :—when the secondary as well as the primary divisions of a leaf are pinnate.
Bipinnatifid :—when the lobes of a pinnatifid leaf are also pinnatifid.
Bisexual :—when both stamens and pistils are present in the same flower.

Blade :—the flat or expanded part of a leaf.
Brachiate :—applied to spreading and divergent branches.
Brachycarpus :—short-fruited.
Brachystachyus :—with short spikes.
Bracteate :—provided with bracts.
Bracteole :—a small bract of a single flower of an inflorescence.
Bracts :—modified leaves between the calyx and the true leaves; often forming an involucre as in *Compositæ*, sometimes coloured.
Bulb :—an arrested usually underground branch, with modified leaves bearing axillary buds, as in the onion.
Bulbiferous :—bearing bulbs,
Bulbil :—a small bulb, usually applied to such as are produced in the leaf-axils of some *Dioscoreas* and lilies.
Bulblet :—*See* bulbil.
Bullate :—having a blistered appearance.

Caducous :—dropping off early or prematurely.
Caerulescent :—verging towards blue.
Caesious :—of a light greyish tint.
Calcarate :—provided with a spur.
Calceolaris :—shaped like a shoe.
Callose :—furnished with hard projections.
Callus :—a hard projection, sometimes applied to an extension of the flowering glume below its point of insertion, and adnate to the axis or rhachilla of the spikelet.
Calycifloræ :—plants which have their petals and stamens adnate to the calyx.
Calyciform :—cup-shaped.
Calycine :—belonging to or resembling a calyx, also applied to a calyx of unusual size.
Calyculate :—bearing a calyx-like involucre outside the true calyx.
Calyptrate :—when the calyx or corolla separates from the flower in the form of a cap, as in some *Myrtaceæ*.
Calyx :—the outer floral envelope.
Campanulate :—bell-shaped
Campestris :—growing in fields.
Campylotropal :—applied to an ovule which becomes curved during its growth so as to bring its micropyle end near to the hilum.
Candicans : -white.
Canescens :—becoming grey or hoary.
Canus :—grey or hoary.
Capillaceous :—slender, like a hair.
Capitellate :—diminutive of capitate.
Capitate :—head-shaped as with some stigmas, or collected into a head like the flowers of *Compositæ*.
Capreolate :—furnished with tendrils.
Capsule :—a dry, dehiscent seed-vessel consisting of more than one carpel.
Carinatus :—keeled.
Cariopsis :—applied to the fruit of a grass, which is 1-celled and 1-seeded, and the pericarp adheres to the seed.
Carnosus :—fleshy.
Carpel :—a simple pistil or a component of a compound pistil. In *Leguminosæ* the pistil consists of a single free carpel, whilst the orange has a compound pistil with several carpels combined.
Caruncle :—an excrescence at or near the micropyle end of some seeds, as in Castor oil. *See* Strophiole.
Catkin :—a deciduous spike of unisexual flowers, as in oaks and willows.
Caudate :—tailed.

Caudicle:—the stalk of a pollinium, as in many orchids.
Caulescent:—becoming stalked.
Cauline:—belonging to the stem.
Centrifugal:—developing or opening from the centre outwards, like the general inflorescence of *Compositæ*.
Centripetal:—developing or opening towards the centre from without, like the individual flowers in the heads of *Compositæ*.
Cernuous:—nodding.
Chalaza:—the part of the ovule where the coats of the nucleus are confluent.
Ciliate:—furnished with hairs forming a fringe-like eye-lashes.
Cinerascens:—becoming ash-coloured.
Cinereous:—ash-coloured.
Circinnate:—involute from the tip into a coil, like the young fronds of a fern, and in many tendrils.
Coarctatus:—crowded together.
Circumscissile:—cut or splitting transversely, like the capsule of henbane or amaranth.
Cirrhose:—furnished with tendrils
Class:—a primary group of Natural orders, *e.g.* Dicotyledons.
Clavate:—club-shaped.
Claw:—the narrowed base of a petal.
Cleft:—cut half-way down.
Cleistogamic:—applied to flowers which become fertilized without opening.
Clinandrium:—the part of the column in orchids where the anther lies.
Coccus:—a one-seeded separable portion of a lobed fruit.
Cochleate:—shaped like a spiral shell.
Collateral:—placed side by side.
Collinus:—growing on hills.
Column:—the stalk of the combined styles and stamens of orchids; also applied to the combined filaments of *Malvaceæ*.
Coma:—a tuft of hairs, applied to such as are found attached to the seeds of willows and of *Asclepiadaceæ*.
Commissure:—the face of union of two carpels, as in *Umbelliferæ*.
Comose:—with tufts of hair.
Complanate:—compressed or flattened.
Concinnus:—neat or elegant.
Concolorous:—of one colour.
Conduplicate:—folded together lengthwise.
Cone:—*See* Strobile.
Confluent:—blended or blending into one.
Connate:—applied to members of the same whorl when united.
Connective:—the part of a stamen which connects the anther-lobes.
Connivent:—coming into contact or converging.
Convolute:—rolled up longitudinally, so that one margin is inside and enveloped by the other.
Cordate:—heart shaped.
Coriaceous:—leathery.
Corm:—a bulb-like fleshy stem or base of a stem.
Corniculate:—furnished with one or more little horns.
Cornute:—horned or spurred.
Corolla:—the interior perianth, composed of free or combined petals.
Corolline:—like a corolla, or attached to a corolla.
Corona:—an extra whorl of bodies representing outgrowths from the corolla or the stamens, as in *Asclepidaceæ* and in the passion-flowers. Compare with ligule.
Corrugate:—wrinkled.
Corymb:—an inflorescence, which has the lower flower-stalks longer than the upper, so as to bring all the flowers to about the same level. In most of the *Cruciferæ* the flowers are arranged in corymbs, which change to racemes when in fruit.
Corymbose:—arranged in corymbs.

Costate:—furnished with one or more primary veins or ribs.
Cotyledon:—applied to the seed-lobes or primary leaves of the embryo.
Crassifolius:—with thick, fleshy leaves.
Crateriform:—shaped like a shallow cup.
Cremocarp:—a dry and seed-like fruit composed of two 1-seeded carpels invested by an epigynous calyx, separating when ripe into two mericarps, as in *Umbelliferæ*.
Crenate:—having rounded teeth.
Cruciferous:—applied to flowers like those of *Cruciferæ* which have cruciform corollas of 4 petals.
Crustaceous:—of brittle texture.
Cryptogamic:—applied to plants which do not produce stamens and pistils and true seeds.
Cucullate:—hood-shaped.
Culm:—the hollow stem or straw of grasses.
Cuneate:—wedge-shaped.
Cupular:—shaped like a small cup.
Cupule:—the cup of fruits like the acorn.
Cusp:—a sharp rigid point.
Cuspidate:—tipped with a cusp.
Cymbiform:—boat-shaped.
Cyme:—an inflorescence of determinate or centrifugal type, usually spreading and flattened; but there are many varieties, and some of these simulate those of the indeterminate or centripetal type.

Decandrous:—having ten stamens.
Deciduous:—falling at normal periods. *See* Caducous.
Declinate:—bent or curved downward or forward.
Decompound:—divided several times.
Decumbent:—reclining, but with the summit ascending.
Decurrent:—applied to leaves which run down the stem and appear to be prolonged below their insertion.
Decussate:—in pairs alternately at right angles.
Definite:—of a limited number, as when the stamens are less than twenty; also applied to a cymose inflorescence where the axis ends in a flower.
Dehiscence:—the mode of opening of a carpel or capsule, or of an anther by slits, pores or valves.
Demersus:—submerged.
Denticulate:—minutely toothed.
Diadelphous:—having stamens in two bundles.
Dichlamydeous:—having both calyx and corolla.
Dichotomous:—forked in pairs.
Diclinous:—applied to unisexual flowers.
Dicotyledons:—plants of the class distinguished by having two cotyledons.
Didymous:—in pairs.
Didynamous:—applied to flowers with four stamens in pairs, and one pair shorter than the other.
Diffuse:—widely or loosely spreading.
Digitate:—applied to a compound leaf, of which all the leaflets are borne on the apex of the petiole.
Dimerous:—applied to cycles or whorls consisting of two parts.
Dimidiate:—halved, or as if one half were wanting.
Dimorphic:—occurring under two forms, as long-styled and short-styled, flowers in the same species.
Dioecious:—unisexual plants with male flowers and female flowers on separate individuals.
Discolor:—of different colours.
Disk:—a development of the torus within the calyx or within the corolla and stamens: the central portion of the head of flowers in *Compositæ*, or the whole head, if

the flowers are regular and homogamous; the expanded base of the style in *Umbelliferæ*.

Dissepiment:—a partition in an ovary or pericarp resulting from the cohesion of the sides of the carpels; sometimes spurious as in *Cruciferæ* and *Cassia Fistula*.

Distachyus:—with two spikes.

Distichous:—applied to leaves arranged in two ranks, and to the florets of many grasses.

Divaricate: very divergent.

Dodecandrous:—having 12 (or from 12-19) stamens.

Dorsal:—relating to or attached to the back.

Drupaceous:—resembling or relating to a drupe.

Drupe:—a fleshy fruit with a hard endocarp which incloses the seed, as in a plum.

Dumetorum:—bushy or relating to bushes.

Eburneus:—ivory-white.

Echinate:—beset with prickles.

Effuse:—expanded or loosely spreading.

Elliptic:—shaped like an ellipse.

Emarginate:—often applied to leaves or petals which are notched at the apex.

Embryo:—the rudimentary plantlet formed in the seed.

Endocarp:—the inner layer of a pericarp

Endosperm:—the albuminous part of a seed often limited to what has been formed within the embryo-sac.

Enneandrous:—with nine stamens.

Ensiform:—sword-shaped.

Entire:—with an even untoothed margin.

Epicalyx:—an involucre of bracts resembling an outer calyx, as in some *Malvaceæ* and in *Potentilla*.

Epicarp:—the outer layer of a pericarp.

Epichile:—the terminal portion of the lip of an orchid when distinct from the basal part.

Epigynous:—on or apparently above the ovary, as when the calyx is adnate to it.

Epipetalous:—on the petals or corolla.

Epiphyte:—growing on another plant, sometimes called air-plant, such as many of the orchids and the *Scitamineæ*.

Equitant:—when leaves are placed as if astride one another, as in *Iris*.

Erianthus:—with woolly flowers.

Eriocarpus:—with a woolly fruit.

Erose:—irregularly toothed, as if bitten.

Everted:—turned inside out.

Exilis:—lank and straight.

Explanatus:—flattened out.

Extrorse:—directed outwards.

Falcate:—sickle-shaped.

Fascicle:—a cluster or bundle.

Fastigiate:—applied to branches which are arranged in somewhat parallel clusters.

Ferruginous:—rust-coloured.

Filament:—a thread-like body, as the stalk of an anther.

Fimbriate:—having a margin bordered with slender processes.

Fistular:—hollow throughout its length, like the leaf and stem of an onion.

Flabellate:—fan-shaped.

Flagellate:—provided with whip-like runners.

Flagelliform:—like the lash of a whip.

Flavidus:—yellowish.

Fluitans:—floating.

Foliaceous:—having the texture of or resemblance to a leaf.

Foliolose:—closely covered with leaflets

Follicle:—a fruit of one carpel, dehiscing by the ventral suture.

Foveolate :—impressed with small pits.
Fruit :—the matured pericarp and its contents, together with any external integral portion of it.
Frumentaceous :—relating to grain.
Frutescent :—becoming shrubby.
Fruticose :—shrubby.
Fugacious :—falling or fading early.
Funicle :—the stalk or chord which connects the ovule or seeds to the placenta.
Funiculatus:—thread-like.
Furcate :—forked.
Furrowed :—grooved.
Fuscous :—greywish-brown.
Fusiform :—spindle-shaped.

Gamopetalous :—with united petals.
Gamophyllous :—applied to a perianth with united segments.
Gamosepalous :—with united sepals.
Geminate :—in pairs.
Geniculate :—abruptly bent.
Genus :—a natural group consisting of one or more species, and which with the species gives the name to a plant.
Gibbous :—a pouch-like enlargement at the base of an organ, as of a calyx.
Glabrous :—smooth.
Glabrescent :—becoming glabrous or nearly so.
Gladiate :—shaped like a sword.
Gland :—a definite secreting structure on the surface of an organ, embedded or ending in a hair; or any gland-like non-secreting protuberance. A viscid enlargement at the base of the stalk of a pollinium in orchids and *Asclepiadaceæ*. Another name for an acorn.
Glandular :—furnished with glands.
Glaucous :—sea-green.
Globose :—somewhat spherical.
Glochidiate :—clothed with barbed bristles.
Glomerate :—compactly clustered.
Glumaceous :—resembling glumes, like the perianth of rushes (Juncus).
Glume :—One of the chaff-like bracts which characterize the inflorescence of grasses and sedges and *Eriocaulon*.
Graveolens :—unpleasantly strong-scented.
Gregarious :—associated, or growing in company.
Guttatus :—spotted.
Gymnospermæ :—the class, including the conifers, which have naked ovules.
Gynandrous :—applied to stamens which are adnate to the pistil, as in orchids.
Gynobasic :—applied to a style which adheres by its base to a prolongation upwards of the torus between the carpels, as in *Labiatæ*.
Gynœcium :—the pistil or carpels of a flower collectively.
Gynophore :—an elongation of the receptacle, forming a stipe or stalk to the pistil.

Habit :—the general appearance of plant.
Habitat :—the kind of locality in which a plant grows.
Hamose :—hooked.
Hastate :—shaped like the head of a spear.
Helicoid :—coiled like a snail-shell.
Heptandrous :—having seven stamens.
Herbaceous :—applied to plants which do not form a persistent woody stem.
Hermaphrodite :—with stamens and pistil in the same flower.
Heterogamous :—bearing two kinds of flowers, as in some *Compositæ* and *Umbelliferæ*.

Hexandrous :—with six stamens.
Heterophyllous :—having differently shaped leaves on the same plant.
Hilum :—the scar left on a seed where it was attached to the funicle or placenta.
Hirsute :—pubescent, with rather long, stiff hairs.
Hirtus :—hirsute.
Hispid :—clothed with stiff hairs or bristles.
Hispidulous :—minutely hispid.
Homagamous :—when the flowers in a head (as in *Compositæ*) are all alike.
Humifuse :—spread on the surface of the ground.
Humilis :—lowly.
Hyalin :—colourless or translucent.
Hypochil :—the basal portion of the lip of an orchid.
Hypocotyl :—the axis of the embryo below the cotyledons.
Hypocrateriform :—salver shaped.
Hypogynous :—inserted beneath the gynæcium or pistil.
Hypoleucus :—applied to leaves with the lower surface white.

Icosandrous :—with twenty or more stamens.
Imbricate :—overlapping.
Imparipinnate :—pinnate with an odd terminal leaflet.
Incanus :—grey or hoary.
Incised :—cut sharply and irregularly.
Incumbent :—leaning upon, applied to cotyledons when the back of one rests, against the radicle.
Indefinite :—more than can easily be counted, as the stamens in a flower ; also applied to an inflorescence the main axes of which elongate indefinitely, as in a raceme ; also known as indeterminate centrifugal or acropetal.
Indehiscent :—not opening in a regular manner.
Induplicate :—with the edges folded inwards.
Inflorescence :—the arrangement of flowers on an axis.
Infundibuliform :—funnel-shaped.
Innate :—borne on the apex of the supporting part.—*See* Adnate.
Innovation :—applied to a vigorous shoot which carries on the further growth of the plant, as in many grasses.
Internode :—the portion of a stem between two nodes.
Integrifollus :—with entire leaves.
Interpetiolar :—between the petioles, like the stipules of Rubiaceæ.
Intrapetiolar :—within the petiole or between it and the stem.
Introrse :—turned inwards towards the axis.
Involucel :—an inner or secondary involucre, as in *Umbelliferæ* with compound umbels.
Involucre :—a whorl of bracts surrounding several flowers, as in *Umbelliferæ* and *Compositæ*.
Involute :—rolled inward.

Junceus :—rush-like.

Labiate :—lipped, usually 2-lipped, as in *Labiatæ*.
Lacerus :—torn.
Laciniate :—cut into narrow lobes.
Lacunose :—with pits or depressions, like the leaves of *Berberis asiatica*.
Lagopus :—like a hare's foot.
Lævigate :—smooth as if polished.
Lanate :—woolly.
Lanceolate :—shaped like a lance or spear-head, or narrowly ovate and tapering to both ends.
Lanuginose :—woolly or cottony.
Lappaceus :—bur-like.
Lasiocarpus :—with pubescent fruit.
Latebrosus :—hidden.

Legume:—the characteristic seed-vessel of *Leguminosæ*, one-celled and two-valved.
Lepidote:—beset with small scurfy scales.
Leptostachyus:—with slender spikes.
Ligneous:—woody.
Ligule:—the thin scarious often hairy projection from the top of the leaf sheath in grasses; also applied to the strap-shaped limb of the ray-florets in *Compositæ*.
Ligulate:—furnished with a ligule.
Limb:—the expanded portion of a gamopetalous corolla; also applied to the expanded portion of a leaf or petal.
Linear:—several times longer than wide, and with parallel sides.
Lineate:—marked with lines.
Lip:—one of the two divisions of a bilabiate calyx or corolla; also applied to the usually large third petal of orchids.
Loculicidal:—dehiscent by the back, *i.e.*, the dorsal suture.
Lodicule:—one of the minute scales found outside the stamens in the flowers of grasses, and which may represent a perianth.
Loment: a legume which is constricted between the seeds, or which separates into one-seeded joints.
Lorate:—thong-shaped.
Lunate:—half moon shaped.
Lyrate:—lyre-shaped, applied to a pinnatifid leaf with the terminal lobe rounded and much larger than the lower ones.

Macrophyllus:—with long leaves.
Macropodous:—applied to an embryo with an enlarged hypocotyl.
Macrostachyus:—with long spikes.
Marcescent:—withering without falling off.
Mentum:—an extension at the foot of the column in some orchids, and projecting in front of the flower.
Micranthus:—with small flowers.
Microphyllus:—with small leaves.
Monadelphous:—when the anthers are united by their filaments into a tube or column.
Monandrous:—having one stamen.
Moniliform:—necklace-shaped.
Monochlamydeous:—with only a single whorl to represent the perianth.
Monocotyledons:—plants of the class distinguished by having only one cotyledon.
Monœcious:—with stamens and pistils in separate flowers on the same plant.
Monticolus:—inhabiting mountains.
Mucronate:—tipped with an abrupt point.
Multiceps:—with many heads.
Multifid:—cleft into many lobes or segments.
Muralis:—growing on walls.
Muricate:—rough with hard tubercles.
Muticous:—blunt, awnless.
Myurus:—tapering like a mouse's tail.

Nanus:—dwarfed.
Nemoralis:—inhabiting woods.
Nerve:—one of the primary ribs of the vascular framework of a leaf, of which the central, or the one extending from base to apex, is known as the midrib.
Nigrescent:—turning black.
Niveus:—snowy white.
Node:—the part of a stem which normally bears a leaf or a whorl of leaves.
Nudicaulis:—having stems without leaves, naked-stemmed.
Nut:—a hard, indehiscent, one-seeded fruit.
Nutans:—nodding.

Nutlet:—diminutive of nut, often applied to the small separable portions of a four-lobed fruit as in many *Labiatæ*.

Obcordate:—heart-shaped, with the notch at the apex.
Oblate:—flattened at both ends.
Obovate:—ovate with the broader end towards the apex.
Ocellate:—with a patch or ring of colour.
Ocreate:—provided with ocreæ or tubular stipules.
Octandrous:—having eight stamens.
Officinalis:—used of medicinal or other plants procurable at shops.
Offset:—a lateral shoot used for propagating.
Oleraceus:—of the nature of a potherb.
Operculate:—furnished with an operculum or lid like the corolla of some *Myrtaceæ*, or a capsule which splits transversely. *See* Circumscissile.
Order:—a systematic group of genera.
Ornithopodus:—shaped like a bird's foot.
Orthotropal:—used of an ovule with a straight axis, the chalaza at the insertion, and the micropyle at the end furthest from the hilum.
Oval:—broadly elliptic.
Ovary:—the portion of the pistil containing the ovules.
Ovate:—shaped like an egg, the broader end at the base.
Ovule:—the young seed in the ovary before fertilization.

Pachyrachis:—with a thick rhachis.
Pale:—the chaff-like scales on the floral receptacles of many *Compositæ*; also applied to the inner bract or glume of the flowers of grasses.
Palmate:—lobed in the form of a hand.
Palmatifid:—cleft in a palmate fashion.
Palmatipartite:—palmately divided nearly to the base.
Palustris:—growing in swampy ground.
Panduriform:—fiddle-shaped.
Panicle:—like a raceme or corymb, with branching pedicels.
Paniculate:—bearing panicles.
Papilionaceous:—applied to the butterfly-shaped corolla of the suborder *Papilionaceæ* of *Leguminoseæ*.
Papillose:—covered with minute superficial projections.
Pappose:—furnished with pappus.
Pappus:—a ring of hairs or scales, which represents the calyx-limb at the apex of the fruit in *Compositæ*.
Parasite:—a plant which grows upon and obtains its nourishment from another plant (its host), such as *Cuscuta* and *Loranthus*.
Parietal:—borne on or relating to a wall.
Parted:—cleft nearly to the base.
Patent:—spreading.
Pectinate:—pinnatifid like a comb, with narrow close-set segments.
Pedate:—palmately divided or parted, with the lateral segments two-cleft, like a bird's claw.
Pedicel:—one of the ultimate branchlets of a compound inflorescence.
Pedicellate:—bearing pedicels.
Peduncle:—the stalk of a flower or of a cluster of flowers.
Pedunculate:—peduncled or borne on a foot-stalk.
Pellucid:—transparent or translucent.
Peltate:—target-shaped, applied to an organ attached by its lower surface instead of at the base or by the margin, as in *Cissampelos* and *Nymphæaceæ*.

Penicillate:—shaped like a little brush.
Penninerved:—pinnately veined.
Pentadelphous:—having the stamens in five bundles.
Pentagynous:—with five pistils or styles.
Pentamerous:—composed of five members.
Pentandrous:—having 5 stamens.
Perennial:—a plant which lives for several years, not dying after flowering and fruiting once.
Perfect:—applied to a hermaphrodite flower.
Perfoliate:—applied to a leaf when the stem apparently passes through it.
Perianth:—the floral envelopes, calyx or corolla, or both.
Pericarp:—the wall of the fructified ovary.
Perisperm:—the ordinary albuminous part of a seed, often restricted to that which is formed outside the embryo sac. *See* Endosperm.
Pertusus:—perforated.
Petal:—the separate or united parts of a corolla.
Petiolate:—furnished with a petiole.
Petiole:—the footstalk of a leaf.
Petiolule:—the petiole of a leaflet.
Phænogams:—having manifest flowers, in contradistinction to Cryptogams.
Phanerogams:—*See* Phænogams.
Phœniceus:—scarlet.
Phyllode:—a petiole which takes the form and performs the functions of a leaf.
Pictus:—marked with colour as though painted.
Pinnate:—when leaflets are arranged on each side of a common petiole.
Pinnatifid:—pinnately cleft.
Pinnatipartite:—pinnately parted.
Pinnatisect:—pinnately parted down to the rhachis.
Pinnule:—one of the primary divisions of a bipinnate leaf.
Pisiform:—pea-shaped.
Pistil:—the female organs of a flower collectively; in its simplest form it consists of a single carpel, as in the pea, with style and stigma, the style being sometimes not present.
Placenta:—the place or process in the ovary to which the ovules are attached.
Platycarpus:—with a broad fruit.
Platyphyllus:—broad-leaved.
Plicate:—folded into plaits.
Plumule:—the primary leaf-bud in an embryo.
Pod:—the same as legume, but often applied to many pod-like many-seeded indehiscent fruits.
Podocarpus:—with a stalked fruit.
Pollen:—the fertilizing dust-like grains formed inside the anthers of flowering plants.
Pollinium:—a more or less coherent mass of pollen-grains, as in *Asclepiadaceæ* and in orchids.
Polyadelphous:—having the stamens in many bundles.
Polyandrous:—having an indefinite number of stamens.
Polycephalus:—with many heads.
Polygamous:—with unisexual and hermaphrodite flowers on the same plant.
Polygamo dicœcious:—dicœciously polygamous.
Polymorphic:—variable as to shape or habit.
Polypetalous:—having separate petals.
Polyrhizus:—with many roots.
Polysepalous:—having separate sepals.
Precatorius:—referring to prayer, as the seeds of *Abrus* which are made into rosaries.
Procerus:—very tall.
Proliferous:—bearing progeny as offshoots.

Prostrate:—lying flat on the ground.
Protandrous:—when the anthers of a flower become mature earlier than the stigma.
Pruriens:—causing an itching sensation.
Puberulous:—slightly or minutely hairy.
Pubescent:—clothed with soft hair or down.
Pulverulentus:—powdered as if dusted.
Pulvinatus:—cushion-shaped.
Pulvinus:—a swelling close under the insertion of a leaf, or the swollen base of a petiole.
Pumilus:—low or little.
Pusillus:—small or slender.
Pyrene:—a nutlet as in *Labiatæ*; also applied to the small stones of a drupe.

Quadrifarius:—in four ranks.
Quinquelocular:—five-celled.

Raceme:—an indefinite form of inflorescence, with an elongating axis and pedicels equal in length.
Racemose:—bearing racemes, or raceme-like.
Radical:—proceeding from or near the root.
Radicle:—the primary root of a seed plant.
Raphe:—the adnate funicle of an anatropous ovule, connecting the hilum with the chalaza, it may be ventral (turned towards the axis) or dorsal (on external face of ovule).
Ray:—the marginal portion of a head or cluster of flowers when distinct, as in some *Compositæ* and *Umbelliferæ*; also applied to the radiating branches of an umbel.
Receptacle:—usually applied to the axis of a flower, that which supports the sepals, petals, stamens and pistil; also called torus or thalamus.
Regular:—when the parts of each whorl in a flower are alike. *See* Actinomorphic.
Reniform:—kidney-shaped.
Repand:—with slightly uneven margin, not quite sinuate.
Repens:—prostrate and rooting.
Replum:—a frame-like placenta, from which the valves of a capsule or other dehiscent fruit fall away as in *Cruciferæ* and *Mimosa*.
Resupinate:—upside down, or appearing so.
Reticulate:—in the form of network.
Retinaculum:—the gland to which one or more pollinia are attached in orchids, applied also to the hook-like funicle as in many of the *Acanthaceæ*.
Retrorse:—directed backward or downward.
Retuse:—with a shallow notch at a rounded apex.
Rhachilla:—a secondary axis in the inflorescence of grasses.
Rhachis:—the axis of an inflorescence or of a compound leaf.
Rhizome:—a rootstock or stem of root-like appearance, prostrate or underground, and giving off rootlets, the apex progressively sending up stems or leaves.
Rhomboid:—approaching a rhombic in outline; quadrangular with the lateral angles obtuse.
Rib:—a primary vein.
Rostellate:—somewhat beaked.
Rostellum:—a narrow extension of the upper edge of the stigma of certain orchids, the abortive anterior lobe.
Rostrate:—beaked.
Rosulate:—collected in a rosette.
Rotate:—wheel-shaped, applied to a spreading gamopetalous corolla with a short tube.
Ruderalis:—growing in waste ground.
Rufous:—pale reddish-brown.
Rugose:—wrinkled.

Rugulose:—somewhat wrinkled.
Ruminate: having the appearance of being chewed, like the endosperm of the nutmeg and of many of the *Anonaceæ*.
Runcinate:—saw-toothed or sharply incised, the teeth or incisions retrorse.
Runner:—an elongated lateral shoot rooting at intervals, often dying off at the internodes.

Sagittate:—shaped like an arrowhead
Samara:—an indehiscent winged fruit.
Sapid:—having a pleasant taste.
Saponaceous:—soapy.
Saprophyte:—a plant which lives on dead organic matter.
Sarmentose:—producing long and flexible runners.
Sativus:—refers to a plant which has been sown or planted.
Scabrid:—roughish.
Scabrous:—rough to the touch.
Scandent:—climbing.
Scape:—a leafless flower-stalk rising direct from the rootstock, as in *Eriocaulon*.
Scapigerous:—with flowers borne on a scape.
Scarious:—thin, dry and membranous, not green.
Scorpioid:—refers to a form of unilateral cyme se inflorescence which is circinately coiled in the bud, strictly with flowers two-ranked, these being alternately thrown to right and left.
Scrobiculate:—marked by minute or shallow depressions.
Sebiferous:—producing vegetable wax.
Secund:—when parts or organs are directed to one side only.
Seed:—the fertilized and matured ovule.
Sepal:—is the name given to each segment, whether free or combined, composing the calyx.
Sepaloid:—resembling a sepal.
Sepiarius:—referring to hedges.
Septicidal:—when a capsule dehisces through the dissepiments or lines of junction.
Septifragal:—when the valves in dehiscence break away from the dissepiments.
Seriate:—disposed in rows, either transverse or longitudinal.
Sericeus:—clothed with silky appressed hair.
Serotinus:—produced late in the season.
Serrate:—margined with teeth directed forwards.
Serrulate:—finely serrate.
Sessile:—without a stalk.
Seta:—a bristle or bristle-shaped body.
Setaceous:—bristle-like.
Setiferous:—bearing bristles.
Setose:—bristly.
Sigmoid:—doubly curved like the letter S.
Siliqua:—a kind of pod characteristic of the *Cruciferæ*, the two valves of which fall away from the frame (replum), to which the seeds are attached, and across which a false partition is formed.
Sinuate:—with a deep, wavy margin.
Spadix:—a spike with a fleshy axis, often restricted to an inflorescence like that met with in aroids, the flowers of which are unisexual and the spike is generally enclosed within a spathe.
Spathe:—a large bract inclosing the inflorescence, as in Ar.sæma.
Spathulate:—obovate with the lower end attenuated.
Spike:—a form of indefinite inflorescence with the flowers sessile on an elongated common axis.
Spikelet:—a secondary spike; also applied to ultimate clusters of florets as in grasses, the clusters of which are subtended by a common pair of glumes.

Spine:—a sharp pointed woody or hardened body, usually a branch, sometimes a petiole, stipule or other part of a leaf.
Spinose:—furnished with spines.
Spur:—a hollow extension of some part of the flower, usually nectariferous
Squamose:—scaly or scale-like.
Squarrose:—rough with spreading and projecting processes.
Stamen:—one of the component parts of the androecium or male element of a flower, consisting of filament and anther or of the latter only.
Staminal:—relating to the stamens.
Staminode:—a sterile or abortive stamen.
Standard:—the posterior and usually the most conspicuous petal of a papilionaceous corolla.
Stenocarpus:—having a narrow fruit.
Stenophyllus:—with narrow leaves.
Stictophyllus:—having leaves covered with raised points.
Stigma:—that part of the pistil which receives the pollen.
Stipe:—a stalk, often applied to the stalk-like support of a carpel or gynæcium.
Stipel:—an appendage to a leaflet, analogous to the stipule of a leaf.
Stipellate:—furnished with stipels.
Stipitate:—having a stipe or special stalk.
Stipular:—relating to stipules.
Stipulate:—bearing stipules.
Stipule:—an appendage at the base of a leaf.
Stolon:—a sucker, runner, or any basal branch which is capable of rooting.
Stoloniferous:—provided with stolons.
Stone:—the hard endocarp of a drupe.
Strictus:—straight or erect.
Strigose:—beset with appressed, straight and stiff hairs or bristles.
Strophiole:—an appendage at the hilum of some seeds. *See* Caruncle.
Style:—the usually attenuated portion of a pistil or carpel between the ovary and the stigma.
Suaveolens:—sweet-scented.
Suberose: of a corky texture.
Subulate:—awl shaped.
Sucker:—a shoot of subterranean origin.
Sulcate:—grooved or furrowed.
Supinus:—prostrate with face upwards.
Surculosus:—producing suckers.
Suture:—a junction or seam of union, often indicating a line of dehiscence.
Syncarpous:—composed of two or more united carpels.
Syngenesious:—with the anthers cohering in a ring.
Synonym:—a superseded or unused name.

Tendril:—a filiform production, either cauline or foliar, by which a plant may climb.
Terete:—circular in transverse section.
Ternate:—in threes.
Ternifolius:—with the leaves in threes.
Tessalate:—chequered.
Testa:—the outer coat of a seed, usually hard and brittle.
Tetradynamous:—having four long stamens and two short, as in *Cruciferæ*.
Tetragonal:—four-angled.
Tetrandrous:—with four stamens.
Tetraspermous:—with four seeds.
Thalamifloral:—when the calyx, corolla and stamens are attached to the thalamus or receptacle below the pistil.
Thalamus:—*see* Receptacle.
Thyrsus:—a contracted or ovate panicle with the main axis inde-

finite and the scondary and ultimate axes cymose.
Thyrsoid :—resembling a thyrsus.
Tomentose :—densely pubescent with wool or short hairs.
Torose :—constricted at intervals.
Torulose :—diminutive of torose.
Torus :—*See* Receptacle.
Triadelphous :—having stamens in three bundles.
Triandrous :—having three stamens.
Tricarinate :—with three keels.
Triceps :—with three heads.
Trichotomous :—three-forked.
Trifoliolate :—with three leaflets.
Trigonous :—three-angled.
Trilobate :—three-lobed.
Trilocular :—three-celled.
Trimorphic :—occurring under three forms, applied chiefly to the relative lengths of stamens.
Tripartite :—three-parted.
Tripinnate :—thrice pinnate.
Triquetrous :—with three salient angles.
Truncate :—as if cut off at the end.
Tuber :—a thickened and short subterranean branch beset with buds or eyes.
Tuberculate :—furnished with excrescences on the surface.
Tuberous :—producing tubers, or resembling a tuber.
Tumid :—swollen.
Turbinate :—shaped like a top.

Uliginosus :—growing in swamps.
Umbel :—an inflorescence, in which all the pedicels radiate from the same point, like the ribs of an umbrella.
Umbellule :—a secondary umbel.
Umbrosus :—growing in shady places.
Unarmed :—without thorns or prickles.
Uncinate :—hooked.
Undulate :—wavy.
Undershrub :—a low shrub, often with herbaceous branches which die down annually.
Urceolate :—pitcher-shaped.
Urens :—burning or stinging.
Utricle :—a small bladder-like pericarp as in *Chenopodium*; also applied to the membranous sac surrounding the fruit in *Carex*, or to any bladder-shaped appendage.

Vaginalis :—sheathed.
Valvate :—opening as if by lids or valves, like the anthers of *Berberis* and *Laurineæ*; also when the parts of a flower-bud exactly meet without overlapping.
Vein :—the branch of a nerve.
Velutinus :—velvety.
Ventral :—usually applied to the anterior or inner face of a carpel, in opposition to dorsal.
Ventricose :—inflated on one side, like the corolla of many *Labiatæ*.
Venulose :—profusely veined.
Verrucose :—warty.
Versatile :—swinging freely on its support, like the anthers of grasses.
Versicolor :—changing colour.
Verticil :—a whorl.
Verticillaster :—a false whorl composed of a pair of opposite cymes, as in many *Labiatæ*.
Vexillum :—*See* Standard.
Villous :—clothed with long soft hairs.
Vimineus :—with long flexible branches.
Virens :—green.
Virgate :—twiggy or rod-like.
Viscid :—sticky or clammy from a gummy secretion.
Vitifolius :—with leaves like those of the vine.
Vittæ :—the aromatic oil tubes of the pericarp of most *Umbelliferæ*.
Viviparous :—germinating or sprouting from seed or bud while still attached to the parent plant.
Volubilis :—twining.

Zygomorphic :—applied to flowers which can be divided into equal halves in one plane only. *See* Actinomorphic.

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SYNOPSIS OF THE NATURAL ORDERS.

THE plan adopted for presenting the diagnoses of the Natural Orders represented in this Flora follows very closely Sir Joseph Hooker's arrangement given in Vol. V (Append I. B.) of Trimen's "Flora of Ceylon." As this synopsis is intended to serve as a key to the Orders represented in this local Flora, I have omitted many special characters belonging to genera which are not likely to be met with within the area. A few of the more important exceptional characters will be found under the different classes, divisions, sub-divisions and natural orders in which they occur.

The following tabulated list of the larger and more important groups of Flowering Plants is given so as to bring into focus the general plan of the classification of the Natural Orders:—

CLASS I. **DICOTYLEDONS.**

DIVISION I. **Polypetalæ.**

SUB-DIVISION 1. **Thalamifloræ.**
(Orders Ranunculaceæ—Tiliaceæ.)

SUB-DIVISION 2. **Discifloræ.**
(Orders Lineæ—Moringeæ.)

SUB-DIVISION 3 **Calycifloræ.**
(Orders Leguminosæ—Cornaceæ.)

DIVISION II. **Gampetalæ**
(Orders Rubiaceæ—Plantagineæ.)

DIVISION III. **Monochlamydeæ.**
(Orders Nyctaginaceæ—Ceratophyllaceæ.)

CLASS II. **GYMNOSPERMS.** (Order Coniferæ.)

CLASS III. **MONOCOTYLEDONS.**

DIVISION I. **Petaloideæ.**
(Orders Hydrocharideæ—Naiadaceæ.)

DIVISION II. **Glumiferæ.**
(Orders Eriocauloneæ- Gramineæ.)

Class I. DICOTYLEDONS.

Herbs, shrubs or trees. *Stem*, when perennial, with pith surrounded by concentric layers of wood and a separable bark, increasing in girth by additional exogenous layers of wood and endogenous layers of bark. *Leaves* net-veined, usually disarticulating. Whorls of *perianth* 4- or 5-merous. *Ovules* inclosed in an ovary. *Embryo* with 2 cotyledons; radicle elongating to form the primary root.

Exceptions. Trimerous flowers occur in Anonaceæ, Menispermaceæ, Berberideæ and in a few other orders. Cotyledons not developed in *Cuscuta* (Convolvulaceæ).

Division I. **Polypetalæ.** *Flowers* with both calyx and corolla. *Petals* free.

Exceptions. Flowers wanting either calyx or corolla occur in:—Ranunculaceæ, Menispermaceæ, Cruciferæ, Bixineæ, Caryophylleæ, Sterculiaceæ, Rutaceæ, Olacineæ, Rhamneæ, Sapindaceæ, Anacardiaceæ, Combretaceæ, Lythraceæ, Samydaceæ, Ficoideæ.—Flowers with petals more or less connate at the base occur in:—Anonaceæ, Menispermaceæ, Ternstrœmiaceæ, Malvaceæ, Ilicineæ, Crassulaceæ, Myrtaceæ, Cucurbitaceæ. See also the exceptional *Gamopetalæ* and *Monochlamydeæ*.

Sub-division 1. **Thalamifloræ.** *Flowers* mostly regular and 2-sexual. *Calyx* infer. (½ infer. in *Portulaca*), of distinct or connate sepals. *Petals* distinct or united at the very base only, hypogynous. *Torus* rarely expanded into a disk. *Stamens* hypogynous. *Ovary* superior (immersed in the torus in *Nymphæaceæ*).

* *Ovary apocarpous* (*apparently syncarpous in* Dillenia *and* Nymphæa). *Flowers regular, 2-sexual except in* Menispermaceæ.

I. Ranunculaceæ. *Sep.* deciduous, often petaloid. *Pet.* sometimes wanting. *Stam.* indef.—Herbs with altern. leaves, or climbing shrubs. (*Clematis*) with opp. leaves; stip. 0 or adnate to petioles.

II. Dilleniaceæ (Dillenia). *Sep.* herbaceous, persistent. *Stam.* indef., in many series. *Seeds* usually arillate, but not in *Dillenia*. Trees with altern. simple leaves, stip. 0.

III. Anonaceæ. *Flowers* usually 3-merous. *Sep.* valvate, in one series. *Pet.* usually in 2 series, fleshy. *Stam.* usually many. *Carpels* usually many, subconnate in *Anona*. *Embryo* small, in ruminated endosperm. Trees or shrubs, with altern. simple entire leaves; stip. 0.

IV. Menispermaceæ. *Flowers* dicœcious or polygam., small, usually 3-merous. *Pet.* shorter than sep., 6, rarely 0. Male fl.:—*Stam.* 6, in 2 series, opp. the pet. Fem. fl.:—*Staminodes* usually 6 or 0, rarely 9. *Carpels* usually 3; *style* lateral or basal. Climbing shrubs with exstip. altern. leaves.

V. Berberideæ (Berberis). *Sep.* and *pet.* 6, similar, imbricate, caducous. *Stam.* 8, opp. pet.; anther-cells opening by ascending valves. *Car-*

pel 1, few-ovuled. *Fruit* fleshy. Shrubs with yellow wood. Leaves spiny-toothed, imparipinnate, or 1-foliolate and fascicled in the axils of stipular spines.

VI. NYMPHÆACEÆ. *Sep.* 4-5. *Pet.* and *stam.* many. *Carpels* many, in pits of the torus or confluent with it. *Ovary* 1-or more-ovuled. *Fruit* a spongy berry, or of nuts sunk in pits of the turbinate torus.—Aquatic herbs, leaves usually peltate.

** *Ovary syncarpous, 1-celled, or 2-celled in* Polygaleæ; *placentas parietal, sometimes meeting to form a 2-or more-celled fruit.*

VII. PAPAVERACEÆ. *Flowers* reg. or irreg. *Sep.* 2 or 3, caducous. *Pet.* twice the sep. *Stam.* indef., free, or (in *Fumaria*) 6 and diadelph. *Ovary* 1-celled; ovules 2 or more, on parietal placentas. *Fruit* a capsule, or an indehiscent 1-seeded nut.—Herbs with milky or coloured juice (except in *Fumaria*). Leaves altern., exstip.

VIII. CRUCIFERÆ. *Sep.* 4, imbricate. *Pet.* 4, rarely 0. *Stam.* 6, the 4 inner longest (tetradynamous). *Ovary* usually 2-celled by a membrance from the placenta, or 1-celled. *Fruit* a 2-valved pod, rarely indehiscent or transversely septate.—Herbs with altern. exstipulate leaves.

IX. CAPPARIDEÆ. *Sep.* 4. *Pet.* usually 4, rarely 0. *Stam.* 4-many, at the base or on the sides of an elongated torus. *Ovary* sessile or stalked, 1-celled; ovules many, on 2-5 parietal placentas. *Fruit* capsular or a berry. *Endosperm* 0.—Trees, shrubs or herbs, with altern. simple or compound leaves; stip. spinescent in *Capparis*.

X. RESEDACEÆ (Oligomeris).—*Cal.* 4-part. *Stam.* 3-8. *Ovary* 1-celled, of 4 connate carpels, 4-lobed and open at the top. *Fruit* a capsule. *Seeds* many, without endosperm.—Herbs with linear fascicled leaves.

XI VIOLACEÆ. *Flowers* reg. or irreg. *Sepals* 5, imbricate, persistent. *Pet.* and *stam.* 5; connective of 2 anthers appendaged. *Disk* annular in *Alsodeia*. *Ovary* 1-celled, with 3 parietal placentas. *Capsule* 3-valved.—Herbs or shrubs, with altern. usually stip. leaves.

XII. BIXINEÆ. *Flowers* 1-or 2-sexual. *Sep.* usually 4-5. *Pet.* 4-5 or 0, imbricate or contorted in bud. *Stam.* many, free, inserted on a disk-like receptacle. *Ovary* 1-celled, or apparently 2-8 celled. *Fruit* capsular or a berry. *Endosperm* oily.—Trees or shrubs, with alt. simple leaves; stip. minute or 0.

XIII. PITOSPOREÆ (Pittosporum). *Flowers* reg. *Sep.* and *pet.* 5. *Stam.* 5, free. *Ovary* 1-celled, or incompletely 2-3-celled. *Capsule* 2-valved. *Endosp.* copious.—Shrubs with altern. simple exstip. leaves.

XIV. POLYGALEÆ (Polygala). *Flowers* irreg. *Sep.* 5, unequal, the 2 inner petaloid. *Pet.* 5 or 3, connate below with the fil. *Stam.* 8, 1-adelph.; anthers opening by pores. *Ovary* 2-celled, with 1 pendulous ovule in each cell. *Fruit* a 2-celled, 2-seeded capsule opening loculicidally. *Seeds* usually strophiolate.—Usually herbs with altern. simple exstip. leaves.

*** *Ovary syncarpous, 1-celled; ovules on a free central or basal placenta.*

XV. CARYOPHYLLEÆ. *Flowers* reg. *Sep.* 4-5, free or connate. *Pet.* 4-5. *Stam.* usually twice the pet., rarely fewer. *Styles* 2-5. *Capsule*,

2-6-valved. *Embryo* curved round mealy endosperm.—Herbs with opp. simple leaves ; stip. scarious or 0.

XVI. PORTULACEÆ (Portulaca). *Flowers* reg. *Sep.* 2, connate below, the free portion deciduous. *Pet.* 4-6, perigynous. *Stam.* 4-many, perigynous. *Ovary* ½ infer. *Capsule* dehiscing transversely. *Embryo* curved round mealy endosperm.—Herbs. Leaves altern. or opp., often with hairy stipular appendages.

XVII. TAMARISCINEÆ (Tamarix). *Flowers* reg. *Sep.* and *pet.* 5, rarely 4, free or connate below. *Stam.* 4, 5, 8 or 10. *Ovary* 1-celled, ovules many, on 3 basal placentas. *Capsule* 3-valved. *Seeds* comose.—Shrubs or trees, with minute altern. simple exstip. leaves.

***[*Ovary syncarpous* (*apocarpous in some* Malvaceæ), *1-many-celled ; placentas axile or basal.*

XVIII. ELATINEÆ (Bergia). *Flowers* reg., minute. *Sep.* and *pet.* usually 5, distinct, imbricate. *Stam.* 3, 5 or 10. *Ovary* 3-5-celled ; cells many-ovuled ; placentas axile. *Capsule* septicidally 3-5-valved.—Annuals or undershrubs.

XIX. TERNSTRŒMIACEÆ. *Flowers* reg., 2-sexual or diœcious. *Sep.* 5, distinct. *Pet.* 5, free or connate at the base. *Stam.* usually many, often adnate to base of deciduous corolla. *Ovary* 3-5-celled ; ovules 2-many in each cell, axile.—Trees or shrubs, with altern. simple exstip. leaves.

XX. DIPTEROCARPEÆ (Shorea). *Flowers* reg., 2-sexual. *Sep.* 5, connate, persist. *Stam.* many ; fil. short, connective subulate. *Ovary* 3-celled ; cells 2-ovuled. *Fruit* inclosed in the enlarged 5-winged cal.—Resinous trees, with altern. simple coriaceous stipulate leaves.

XXI. MALVACEÆ. *Flowers* reg., usually 2-sexual. *Sep.* 5, valvate, free or connate. *Pet.* 5, imbricate, twisted. *Stam.* usually many, 1-adelph., the tube adnate to base of pet. ; anth. 1-celled. *Ovary* 2-many celled ; ovules 1 or more in each cell, axile. *Fruit* of distinct carpels or capsular. *Embryo* curved.—Trees, shrubs or herbs. Leaves altern. simple or rarely compound, stipulate.

XXII. STERCULIACEÆ. *Flowers* 2-or 1-sexual, usually regular. *Sep.* 5, more or less connate, valvate. *Pet.* 5, connate below or 0. *Stam.* 5-20 ; fil. more or less connate ; anth. 2-celled. *Carpels* 2-5 (1 in *Waltheria*). *Fruit* of follicles, or a loculicidal capsule.—Herbs, shrubs or trees. Leaves altern., simple or compound, stipulate.

XXIII. TILIACEÆ. *Flowers* mostly 2-sexual and reg. *Sep.* 5 or 4, free or connate. *Pet.* 5 or 4, distinct *Stam.* usually many, distinct ; anthers 2-celled. *Ovary* usually 2-5-celled ; style simple ; ovules 2-many in each cell. *Fruit* a capsule or drupe. *Endosp.* fleshy.—Herbs, shrubs or trees. Leaves usually altern., stipulate.

SUB-DIVISION 2. **Discifloræ.** *Sep.* distinct or connate, rarely super. to ovary. *Pet.* distinct, or connate at the very base. *Torus* generally expanded into a pulvinate or cupular disk between the pet. and ovary, rarely of glands or 0.

Exceptions. Disk obscure in *Malpighiaceæ*, or lining the cal. in *Rhamneæ* and *Anacardiaceæ* ; not present in *Ilex*, *Coriaria* and in some *Lineæ*

and *Geraniaceæ*. Cal. super. in *Gouania*, *Helinus*, and more or less adnate to ovary in other genera of *Rhamneæ*. Pet. in *Coriaria* become fleshy and inclose the ripe carpels.

Ovules pendulous, raphe ventral.

XXIV. LINEÆ. *Flowers* reg. and 2-sexual. *Sep.* usually 5, free or connate below, imbricate. *Pet.* 5, imbr., often contorted. *Stam.* usually with interposed staminodes; fil. more or less connate. *Disk* of glands, or obscure. *Ovary* 3-5-celled; cells 1-2-ovuled; styles 3 or 5. *Fruit* a capsule or drupe. *Endosp.* scanty.—Usually herbs or shrubs, with altern. simple leaves.

XXV. MALPIGHIACEÆ. *Flowers* reg. or irreg., 2-sexual. *Cal.* 5-part. One of the segments with a large gland outside (in *Hiptage*). *Pet.* 5, imbr. *Disk* obscure. *Stam.* 10. *Ovary* 3-celled, with 1 ovule in each cell. *Fruit* of 1-3 winged nuts. *Seeds* without endosp.—Trees or shrubs, often climbing. Leaves opp. stip., minute or 0.

XXVI. ZYGOPHYLLEÆ. *Flowers* reg., 2-sexual. *Sep.* and *pet.* 4-5, distinct, imbr. *Stam.* 10 or more (12—15 in *Peganum*), inserted at the base of the lobed disk. *Ovary* 4-5-lobed or-winged; cells 2-many ovuled. *Fruit* dehiscent or not.—Herbs or shrubs. Leaves opp. (altern. in *Peganum*), compound, stipulate, not gland-dotted.

XXVII. GERANIACEÆ. *Flowers* reg. or irreg., 2-sexual. *Sep.* free, usually 5, equal or unequal, one of them sometimes spurred or saccate. *Pet.* 5 (very unequal in *Impatiens* and *Hydrocera*) *Stam.* 5-15. *Disk* of 5 glands or 0. *Ovary* 5-celled; cells few-or many-ovuled. *Fruit* of five 1-seeded cocci, or a capsule, or (in *Hydrocera*) a drupe.—Herbs or shrubs, rarely trees, with altern. or opp., simple or compound, usually 2-stipulate leaves.

XXVIII. RUTACEÆ. *Flowers* 2-or 1-sexual. *Sep.* 4-5, imbr. *Pet.* 4-5, distinct, imbr. or valvate. *Disk* large or small. *Stam.* usually def. (many in *Citrus* and *Ægle*). *Carpels* 4-5, free or connate; ovules 1—2 or many in each cell. *Fruit* various.—Usually trees or shrubs. Leaves simple or compound, exstip., pellucid-punctate.

XXIX. SIMARUBEÆ. *Flowers* usually reg., 1-or 2-sexual, *Sep.* 5. *Pet.* 5, imbr. or valvate. *Stam.* 10, distinct, inserted at base of disk. *Ovary* free, lobed or entire, 1-5-celled, cells 1-ovuled. *Fruit* of 1-5 one-seeded indehiscent winged carpels, or a 1-seeded drupe.—Trees or shrubs, with altern. stip. usually pinnate leaves.

XXX. OCHNACÆ. (Ochna). *Flowers* reg., 2-sexual, conspicuous. Sep. 5, imbr., persist. *Pet.* 5-10, imbr. *Stam.* many. *Disk* tumid. *Ovary* 3-10-lobed; ovules solitary in each cell. *Fruit* of 3-10 sessile drupes.—Glabrous trees or shrubs, with altern. simple stip. shining, coriaceous leaves.

XXXI. BURSERACEÆ. *Flowers* reg., 2-sexual or polygamous. *Cal.* lobes 5 or 4. *Pet.* 5 or 4, valvate or imbr. *Stam.* 8-10. *Disk* annular, cup-shaped or lining the cal.-tube. *Ovary* 2-5-celled; ovules 2 in each cell. *Fruit* a drupe, containing 1-5 nuts (in *Boswellia* finally separating). *Seeds* without endosp.—Resinous trees or shrubs, with altern. compound exstip. leaves.

XXXII. MELIACEÆ. *Flowers* reg., 1-or 2-sexual. *Cal.* 3-6-lobed. *Pet.* 3-6, usually imbr. *Stam.* 4-12, 1-adelph. except in *Cedrela* and *Chloroxylon*.

Disk annular (0 in *Amoora*). *Ovary* 2-5-celled; cells 1-2-many-ovuled, style simple. *Fruit* a capsule or drupe.—Usually trees with altern. compound exstip. leaves.

** *Ovules pendulous, raphe dorsal.*

XXXIII. OLACINEÆ. *Flowers* reg., usually 2-sexual. *Cal.* cup-shaped, minute (obsolete in *Cansjera*). *Pet.* 3-6, valvate. *Disk* cup-shaped. Fertile stam. 3 or 4-5. *Ovary* 1-5-celled; ovules 1-3 in each cell, pendulous. *Drupe* 1-celled, 1-seeded. *Endosp.* copious.—Usually trees or shrubs, with altern. simple exstip. leaves.

XXXIV. ILICINEÆ (Ilex). *Flowers* dicœcious. *Cal.* 4-lobed, imbr. *Pet.* 4, connate at base. *Stam* 4-5, adnate to base of corolla. *Disk* 0. *Ovary* 2-or more-celled; stigma large, sessile; ovules 1-2 in each cell, pendulous. *Fruit* a drupe, with 2 or more 1-seeded stones. *Endosp.* fleshy.—Usually trees with altern. simple exstip. evergreen leaves.

*** *Ovules erect, raphe ventral.*

XXXV. CELASTRINEÆ. *Flowers* reg., 2-sexual or polygamous. *Cal.* 4-5-lobed, persistent. *Pet.* 4-5, imbr. or valvate. *Stam.* 3-5. *Ovary* free or immersed in the large disk, 2-5-celled, with 2-or more erect ovules in each cell. *Fruit* dehiscent or not.—Trees or shrubs, with simple usually coriaceous leaves; stip. deciduous or 0.

XXXVI. RHAMNEÆ. *Flowers* 2-sexual, rarely polygamous. *Cal.* 4-5-lobed (super. in *Gouania* and *Helinus*), lobes valvate. *Pet.* small, 4-5 or 0. *Disk* lining the cal.-tube, often with a free margin. *Stam.* 4-5, opp. pet. *Ovary* 2-4-celled, with 1 erect ovule in each cell. *Fruit* indehiscent (except in *Helinus*).—Trees or shrubs, often climbing. Leaves altern., simple, stip.

XXXVII. AMPELIDEÆ. *Flowers* rarely 1-sexual. *Cal.* cup-shaped, entire or obscurely lobed. *Pet.* 4-5, distinct or connate, valvate. *Disk* large, cupular or annular. *Stam.* 4-5, opp. to pet., free, or connate and adnate to pet. *Ovary* 2-celled, cells 2-ovuled, or 6-celled and with 1 ovule in each cell. *Fruit* a berry.—Shrubs or herbs, usually climbing. Leaves altern., stip., simple or compound.

**** *Ovules ascending, or pendulous from an erect funicle, raphe ventral, or reversed.*

XXXVIII. SAPINDACEÆ. *Flowers* often irreg. and usually polygam. *Sep.* 4-5, distinct and imbr., or connate into a 4-6-lobed valvate cal. *Pet.* 4-5, distinct (wanting in *Schleichera* and *Dodonæa*). *Disk* annular or unilateral. *Stam.* 5-10, fil. distinct. *Ovary* 1-6-celled; ovules 1 or 2 in each cell. *Fruit* capsular or indehiscent, sometimes winged.—Trees, shrubs or herbs. Leaves usually altern. (opp. in *Acer*), simple or compound, exstip.

XXXIX. SABIACEÆ. *Flowers* often irreg., usually 2-sexual. Cal.-lobes 4-5, imbr. *Pet.* 4-5, often unequal. *Disk* small, annular or cupular, 3-5-toothed. *Stam.* 5 (only 2 fertile in *Meliosma*). *Ovary* usually 2-celled, with 2 superposed ovules in each cell. *Fruit* a 1-celled 1-seeded drupe, or

of 2 dry indehiscent carpels. *Endosp.* 0.—Trees or climbing shrubs, with altern. exstip. simple or compound leaves.

XL. ANACARDIACEÆ. *Flowers* 1-or 2-sexual. *Cal.* 3-5-part. *Pet.* free, 3-5, rarely 0. *Disk* annular. *Ovary* of 5 distinct 1-ovuled carpels, or carpels combined into a 2-5-celled ovary. *Drupe* with a 1-celled 1-seeded stone (2-5 celled in *Spondias*). *Embryo* large, endosp. 0.—Trees or shrubs, with altern. simple or compound exstip. leaves.

The two following natural orders are of doubtful affinity:—

XLI. CORIARIEÆ. (Coriaria). *Flowers* small, reg., 2-sexual. *Sep.* 5 imbr., persistent. *Pet.* 5, keeled within. *Stam.* 10, free, or the altern. ones adnate to pet., anth. exserted. *Disk* 0. *Carpels* 5, distinct, 1-celled, whorled on a fleshy receptacle; ovules 1 in each cell, pendulous. *Fruit* of 5 distinct 1-celled 1-seeded nuts embraced by the enlarged fleshy pet. —Glabrous shrubs with 4-angular branches. Leaves usually opp. and exstip.

XLII. MORINGEÆ. (Moringa). *Flowers* large., irreg., 2-sexual, *Cal.* 5-cleft, segments unequal, petaloid, deciduous from above the base, imbr. *Pet.* 5, unequal. *Stam.* on edge of disk, declinate; fertile 5 and opp. pet.; anth. 1-celled. *Ovary* stalked, 1-celled; ovules many, in 2 series, on 3 parietal placentas. *Capsule* elongate, 1-celled, loculicidally 3-valved. *Seeds* many, endosp. 0.—Trees with bi-or tripinnate leaves; stip. gland-like.

SUB-DIVISION 3. **Calycifloræ.** *Flowers* reg., or irreg., 1-or 2-sexual. *Cal.* super. or infer. *Pet.* distinct or united at the base perigynous. *Disk* rarely present. *Stam.* perigynous or epigynous.

Exceptions. Stam. obscurely perigynous in *Leguminosæ*, epipetalous in *Kalanchœ* (*Crassulaceæ*).

**Ovary super., of 1 or more free or connate carpels; infer. in some* Rosaceæ *also in* Vahlia (Saxifragaceæ). *Styles usually as many as the carpels.*

XLIII. LEGUMINOSÆ. *Flowers* usually irreg. and 2-sexual. *Cal.-lobes* usually connate, often 2-lipped. Pet. 5 or fewer, rarely 0 or connate. usually very unequal (papilionaceous). *Stam.* normally 10, diadelph. or monadelph, and declinate, or many, rarely all distinct. *Ovary* free, 1-celled. ovules 1 or more, on the ventral suture. *Fruit* a dehiscent or indehiscent 1-many-seeded pod. *Cotyledons* large; endosp. usually 0.—Trees, shrubs or herbs, often climbing. Leaves altern., usually compound stipulate.

XLIV. ROSACEÆ. *Flowers* reg. and 2-sexual, rarely polygam. *Pet.* 5. *Stam.* many, distinct. *Ovary* of 1 or more free or connate carpels; ovules 1 or 2 in each carp. *Fruit* various. *Endosp.* 0.—Herbs, shrubs or trees. Leaves altern., simple or compound, stipulate.

XLV. SAXIFRAGACEÆ. *Flowers* reg., 2-sexual. *Cal.* more or less adnate to ovary, lobes 5. *Pet* 5. *Disk* epigynous. *Ovary* 1-or 2-celled (superior in *Vahlia*), styles 1 or 2, ovules many, parietal or axile. *Fruit* a capsule. *Seeds* many.—Herbs or shrubs, with opp. altern. exstip. leaves.

XLVI. CRASSULACEÆ (Kalanchoe). *Flowers* reg. and 2-sexual. *Cal.* 4-lobed. *Cor.-tube* inflated; lobes 4, spreading. *Stam.* 8, in 2 series, on the corolla-tube. Glands of *disk* 4, hypog. *Carpels* 4, adnate to base of cor.-tube; ovules many. Fruit of 4 many-seeded follicles.—Herb with opp. fleshy exstip. leaves.

** *Ovary infer., or included in cal.-tube, syncarpous; style undivided; cells 2-or more-ovuled.*

XLVII. RHIZOPHOREÆ (Carallia). *Flowers* reg., 2-sexual. *Cal.* super; lobes 4—8. *Pet.* as many as cal.-lobes, margin dentate. *Stam.* twice as many as pet., inserted with them outside an annular crenulated disk. *Ovary* 4-celled, with 2 pendulous ovules in each cell. *Fruit* indehiscent, 1-seeded. — *C. integerrima* is an evergreen tree with opp. stipulate shining coriaceous leaves.

XLVIII. COMBRETACEÆ. *Flowers* reg., 1-or 2-sexual. *Cal.* super., limb tubular; lobes 4—5, valvate. *Pet.* 4, 5 or 0. *Stam.* 8 or 10. *Ovary* 1-celled; ovules 2—5, pendulous. *Fruit* indehiscent, 1-seeded. *Cotyledons* large, endosp. 0.—Trees or shrubs, with simple exstip. leaves.

XLIX. MYRTACEÆ. *Flowers* reg., 2-sexual. *Cal.* super.; limb short, 4—5-lobed. *Pet.* 4 or 5, free or united in a cap. *Stam.* many, epigynous. *Ovary* 2—4-celled, cells many-ovuled, style simple. *Fruit* indehiscent, 1-many-seeded; endosp. 0.—Trees or shrubs, with simple usually gland-dotted leaves; stip. small or 0.

L. MELASTOMACEÆ. *Flowers* reg., 2-sexual. *Cal.* super.; limb tubular 3—5-lobed. *Pet.* 3—5, contorted in bud. *Stam.* 3, 8, or 10, on the cal.-tube; anth. opening by pores at the summit, connective, often appendaged. *Ovary* 3—5-celled, cells many-ovuled, style simple. *Fruit* a many-seeded capsule.—Herbs with opp. exstip. leaves.

LI. LYTHRACEÆ. *Flowers* 2-sexual. *Cal.* infer. (super. in *Punica*); lobes 3—6, rarely more, valvate, persistent. *Pet.* as many as cal.-lobes, rarely 0, crumpled. *Stam.* def. or many, inserted on cal.-tube. *Ovary* 1—6-celled or (in *Punica*) many-celled; ovules usually many, style simple. *Capsule* many-seeded. *Endosp.* 0.—Trees, shrubs or herbs, with opp. entire exstip. leaves.

LII. ONAGRACEÆ. *Flowers* reg., 2-sexual. *Cal.* super. or ½ super.; lobes 3—6, valvate. *Pet.* 3—6, rarely 0. *Stam.* as many as or twice the number of pet., epigynous. *Ovary* 2—5-celled; ovules usually many (solitary in each cell in *Trapa*). *Fruit* a many-seeded capsule (indehiscent and 1-seeded in *Trapa*).—Herbs, often aquatic, or undershrubs. Leaves altern., stipulate in *Trapa*.

*** *Ovary infer., or super., syncarpous, 1-celled or 3-celled by fusion of placentas; styles distinct, or connate below.*

LIII. SAMYDACEÆ (Casearia). *Flowers* reg. *Cal.* infer., 4—5-lobed. *Pet.* 0. *Stam.* 8, connate, with alternating staminodes, hypogynous. *Ovary* 1-celled; ovules many, parietal, stigma 3-fid. *Capsule* soft, loculicidally 3-valved. *Seeds* arillate, endospermous.—Shrubs or small trees, with altern. simple leaves; stip. minute, deciduous.

LIV. CUCURBITACEÆ. *Flowers* reg., 1-sexual. MALE :—*Cal.-tube* short, 5-lobed. *Pet.* 5, usually connate. *Stam.* 3, rarely 5, on the cal.-tube ; anth. free or connate, cells usually conduplicate. FEM.:—*Cal.-tube* wholly adnate to ovary (except in *Actinostemma*), limb. 5-fid. *Staminodes* 3 or 5. *Ovary* 1-celled ; placentas 3, fleshy, often meeting in the centre, stigmas 3, ovules usually many. *Fruit* fleshy, rarely dehiscent.—Herbs with spiral tendrils. Leaves altern., simple, lobed or compound.

LV. BEGONIACEÆ (Begonia). *Flowers* monœcious. *Male perianth* of 2 outer valvate opp. sepaloid segments, and of 2 inner smaller segments or 0. *Stam.* many, usually 1-adelph. *Fem. perianth* of 2—5 segments. *Ovary* infer., 3-celled ; ovules many, on axile placentas ; style-branches 3. *Fruit* a 3-gonous capsule, winged at the angles. *Seeds* many, minute.—Succulent herbs with altern. stip. leaves.

LVI. FICOIDEÆ. *Flowers* reg., usually 2-sexual. *Sep.* 5, infer. *Pet.* 0. *Stam.* perig. or hypog. *Ovary* 2—5-celled, or of 5 free 1-ovuled carpels. *Fruit* a capsule, or of 5 free indehiscent carpels. *Seeds* reniform ; embryo curved round mealy endosp.—Herbs with simple opp. or whorled leaves.

LVII. UMBELLIFERÆ. *Flowers* in umbels, usually reg., 2-sexual or polygam. *Cal.* super.; limb 5-fid. or 0. *Pet.* 5, often inflexed, free, valvate or imbr. *Stam.* 5, epig. *Ovary* 2-celled, crowned with a large epig. disk ; cells with 1 pendulous ovule, styles 2. *Fruit* of 2 indehiscent carpels, pendulous from the summit of the carpophore, each 5-ridged, and often traversed by oil-canals.—Herbs with altern. simple or compound exstip. leaves ; petioles usually dilated at base.

LVIII. ARALIACEÆ. *Flowers* reg., 1-or 2-sexual. *Cal.* super., limb small or 0. *Pet.* 5—6, valv. *Stam.* as many as pet., epig. *Ovary* 2-or more-celled, crowned with a disk ; ovules solitary and pendulous in each cell, styles as many as the cells, distinct or united. *Fruit* a drupe or berry, with 1 or more 1-seeded cells. *Endosp.* fleshy.—Trees or shrubs, often climbing. Leaves altern., simple or compound ; stip. adnate to petioles or 0.

LIX. CORNACEÆ. *Flowers* reg., 2-sexual. *Cal.* super ; limb 4—10-fid. *Pet.* 4—10, valvate. *Stam* 4—8 or more, epig. *Disk* epig. *Ovary* 1-celled or 2—3-celled at the base, style simple ; ovule 1, pendulous. *Fruit* a berry or drupe. *Endosp.* fleshy.—Trees or shrubs, with altern. leaves ; stip. 0.

DIVISION II.—**Gamopetalæ.** *Flowers* usually 2-sexual, reg. or irreg. *Cal.* super. or infer. *Pet.* connate, forming an entire or cleft corolla, rarely free to a little above the base. *Stam.* inserted on cor., rarely hypog. or epig.

Exceptions. Limb of cal. obsolete in some RUBIACEÆ, and in many of the COMPOSITÆ.—Flowers with free pet. occur in : CANPANULACEÆ, MYRSINEÆ, EBENACEÆ and OLEACEÆ.—Cor.-lobes in 2 series in *Mimusops* (SAPOTACEÆ). Cor. scarious in PLANTAGINEÆ.—Stam. indef. in *Symplocos* (STYRACEÆ), and in some EBENACEÆ.—Stam. free and hypog. in *Plumbago* and *Vogelia* (PLUMBAGINEÆ).—In ASCLEPIADACEÆ the pollen adheres in masses (pollinia) as in the *Orchideæ*.

1. *Flowers* reg. or irreg. *Cal.* usually super. *Stam.* as many as the cor.-lobes, rarely fewer, epipet. or epig.

LX. RUBIACEÆ. *Flowers* usually reg. and 2-sexual. *Cal.* super., limb usually 4- 5-cleft. *Corolla* tubular to rotate, usually 4- 5-lobed. *Stam.* as many as cor.-lobes, inserted on the tube altern. to lobes. *Ovary* 2-or more-celled, rarely 1-celled ; ovules 1 or more in each cell ; style simple. *Disk* epig. *Fruit* a berry drupe or capsule, or of distinct cocci, 2-many-seeded. *Endosp.* horny.- Herbs, shrubs or trees. Leaves opp., with interpetiolar stip., or (in Tribe GALIEÆ) whorled and exstip.

LXI. COMPOSITÆ. *Flowers* reg. or irreg., 1-or 2-sexual, arranged in a head on a common receptacle and surrounded by an involucre of bracts, all tubular (head discoid), or the outer or all ligulate (flowers rayed). *Cal.* super.; limb of hairs (*pappus*), or scales, or 0. *Cor.* of ray-flowers with the lobes connate in a strap, of disk flowers with 4 or 5 valvate spreading lobes. *Stam.* on the cor.-tube, fil. free, anth. connate (in *Xanthium* the fil. are connate and anth. free). *Ovary* 1-celled ; ovule 1, erect. *Disk* epig. *Fruit* an achene with or without pappus.—Herbs or shrubs, rarely trees. Leaves mostly altern.; stip. 0.

LXII. CAMPANULACEÆ. *Flowers* reg. or not, 2-sexual. *Cal.* super. or ½ super. (*Sphenoclea*), limb 5-part. *Cor.* 5-lobed, or 2-lipped and dorsally cleft to base, lobes valvate. *Stam.* 5, epig. or (in *Sphenoclea*) on base of cor.-tube ; anth. distinct or connate. *Ovary* 2—8-celled, many-ovuled ; stigmas 2—3-lobed. *Capsule* many-seeded.—Herbs with altern. exstip. leaves.

2. *Flowers* reg., rarely 1-sexual. *Cal.* infer., rarely ½ infer. *Stam.* hypog., perig., epig. or epipet., as many as or twice the number of cor.-lobes, or indef. *Ovary* 1-or more-celled.

LXIII. PLUMBAGINEÆ. *Cal.* infer., tubular, 5-part., persist. *Cor.* persist., tube long : lobes 5, only slightly connate at base, twisted in bud. *Stam.* 5, opp. pet., hypog. *Ovary* 1-celled, ovule pendulous from a basal funicle, style simple, stigmas 5. *Capsule* circumsciss. at base.—Herbs or small shrubs with altern. stip. leaves.

LXIV. PRIMULACEÆ. *Cal.* infer. (½ infer. in *Samolus*), 5-cleft, persist. *Cor.* hypog. (perig. in *Samolus*); lobes 5, imbr. *Stam.* 5, on cor.-tube and opp. the lobes. *Ovary* 1-celled ; ovules many, on a free central placenta. Capsule 5-valved or circumsciss.—Herbs with opp. or altern. leaves, stip. 0.

LXV. MYRSINEÆ. *Flowers* often 1-sexual. *Cal.* infer. or ½ infer., persist. *Cor.* 4—5-part. *Stam.* epipet., as many as cor.-lobes and opp. to them. *Ovary* 1-celled ; ovules few or many, on a free central placenta, style simple. *Fruit* a berry, 1-or more-seeded, endospermous.—Trees or shrubs, with altern. simple exstip. leaves.

LXVI. SAPOTACEÆ. *Cal.* infer., persist., 6—8-part. *Cor.-lobes* 5—14, or 15—24 in 2 series. *Stam.* 5 8, altern. with staminodes, or many and without staminodes. *Ovary* about 6 - 8-celled, with 1 ovule in each cell. *Berry* 1—6-seeded. *Seeds* large, shining.—Trees with altern. entire exstip. leaves.

LXVII. EBENACEÆ. (Diospyros). *Flowers* 1-sexual. *Cal.* infer., 4- 5-lobed, accrescent. *Cor.* tubular or urceolate, lobes twisted. MALE

FL. :—*Stam.* 4 to many (usually about 16), on base of cor., or on the torus. FEM. FL. :— *Staminodes* 2-10. *Ovary* 3-or more-celled, with 1, rarely 2 ovules in each cell. *Fruit* indehiscent, 1-10-seeded. *Seeds* large, endosp. copious.—Trees or shrubs, with altern. or opp. entire exstip. leaves.

LXVIII. STYRACEÆ. (Symplocos). *Flowers* 2-sexual. *Cal.* super.; limb small, 5-lobed, imbr. *Pet.* 5, free or slightly connate at base, imbr. *Stam.* many and in several series, at the base of the cor. *Ovary* 2—3-celled; ovules 2, pendulous in each cell, style simple. *Drupe* 1-3-seeded. *Endosp.* copious.—Trees or shrubs with altern. exstip. leaves.

3. *Ovary* super., rarely infer. *Stam.* as many as and altern. with cor.-lobes, or fewer. *Carpels* 2, rarely 1 or 3.

* *Flowers reg. Leaves usually opposite.*

LXIX. OLEACEÆ. *Flowers* usually 1-sexual. *Cal.* infer., 4-9-lobed. *Cor.-lobes* 4-5 or more. *Stam.* 2, on base of cor. *Ovary* 2-celled, cells 1-2-ovuled (3-4 in *Schrebera*), style simple, often 2-lobed. *Fruit* a capsule berry or drupe. *Seeds* 1-2 in each cell.—Trees or shrubs. Leaves opp., rarely altern.; simple or pinnate, stipules 0.

LXX. SALVADORACEÆ (Salvadora). *Flowers* 1-or 2-sexual. *Cal.* infer., 4-part., lobes imbr. *Stam.* 4, epipet. *Ovary* 1-celled, with a solitary erect ovule. *Fruit* a 1-seeded drupe. *Endosp.* 0.—Trees or shrubs, with opp. entire exstip. leaves.

LXXI. APOCYNACEÆ. Flowers 2-sexual. *Cal.* infer., 5-part., often with scales or glands within. *Corolla* salver-shaped or rotate; lobes 5, contorted. *Stam.* 5, inserted on cor.-tube, free or adnate to the stigma, pollen granular. *Disk* various or 0. *Carp.* 2, distinct, 1-or 2-celled, few- or many-ovuled, style 1, stigma 2-fid. *Fruit* a berry or drupe, or of 2 distinct or connate follicles. *Seeds* often comose at one or both ends.—Trees, shrubs or herbs, with usually milky juice. Leaves opp. or whorled, entire, exstip.

LXXII. ASCLEPIADACEÆ. *Cal.* infer.; lobes 5, imbr. *Cor.-tube* with often a ring of scales in the throat; lobes 5, valvate or contorted. *Stam.* 5, on base of cor., fil. usually connate in a fleshy tube; anth. adnate by a broad connective to the stigma, 2-celled; pollen in 1 or 2 erect or pendulous granular masses in each cell, the masses of contiguous cells of different anthers attached to glands at the angles of the stigma. *Carp.* 2, distinct, inclosed in the stam.-tube, many-ovuled; styles 2; stigma 1, adnate to the anth. *Follicles* 2. Seeds many, crowned with a long pencil of hairs, endosp. copious.—Herbs or shrubs, usually twining. Leaves opp., exstip., entire, rarely 0.

LXXIII. LOGANIACEÆ. *Cal.* infer., segments 4 or 5. *Cor.-lobes* 4 or 5, valvate or imbr. *Stam.* 4 or 5, on the cor.-tube, fil. distinct. *Ovary* 2-celled, ovules many in each cell. *Fruit* indehiscent or a capsule. *Seeds* 1, 2 or many, endosp. copious.—Trees, shrubs or herbs, with opp. leaves.

LXXIV. GENTIANACEÆ. *Cal.* infer., 4-5-part. *Cor.* rotate tubular campanulate or ventricose; lobes 4-5, contorted, rarely valvate. *Stam.* on tube or throat of cor., and as many as the lobes, fil. distinct. *Ovary* 1-celled, with parietal placentas, rarely 2-celled, many-ovuled;

style simple, stigmas 2. *Fruit* a many-seeded capsule.—Herbs with opp. exstip. leaves

** *Flowers reg. Leaves usually altern.*

LXXV. HYDROPHYLLACEÆ (Hydrolea). *Cal.* infer., 5-part. *Cor.* rotate, 5-cleft, lobes imbr. *Stam.* 5, on cor.-tube, fil. distinct. *Ovary* 2-celled, cells many-ovuled, styles 2. *Capsule* septicidally 2-valved, many-seeded. *Seeds* minute.—Herbs with altern. exstip. leaves. Flowers racemose.

LXXVI. BORAGINEÆ. *Flowers* rarely 1-sexual. *Cal.* infer., 4-8 (usually 5)-cleft, persist. *Cor.* tubular, funnel-shaped or rotate; lobes usually 5, imbr. *Stam.* on cor.-tube, as many as the cor.-lobes and altern. with them, fil. distinct. *Ovary* 2-celled and with 2-ovules in each cell, or 4-celled and with 1 ovule in each cell, styles 1 or 2. *Fruit* a drupe or of 2-4 nutlets.—Trees, shrubs or herbs. Leaves rarely opp., stip. 0. Inflor. corymbose, usually of scorpioid cymes.

LXXVII. CONVOLVULACEÆ. *Cal.* infer., persist., 5-part., or of 5 imbr. sep. *Cor.* campan. or funnel-shaped; lobes 5, plaited or contorted in bud. *Stam.* 5, on the cor.-tube, fil. free. *Ovary* often surrounded by an annular disk, 2-celled with 2 ovules in each cell, or 4-celled and with 1 ovule in each cell, styles simple or 2-fid., stigmas 2. *Fruit* dry or fleshy, indehiscent or 2-4-valved or circumsciss., 1-4-seeded; endosp. 0; cotyl. plaited (0 in *Cuscuta*).—Herbs or shrubs, often twining. Leaves altern. (0 in *Cuscuta*). Flowers usually cymose.

LXXVIII. SOLANACEÆ. *Cal.* infer., often persist. and enlarged, 5-cleft. *Cor.* campan. funnel-shaped or rotate; lobes 5, plaited or valvate in bud. *Stam.* 5, on cor-tube; anth-cells sometimes opening by pores. *Ovary* 2-celled or imperfectly 4-celled, style and stigmas simple; ovules many, on large placentas. *Fruit* a berry or capsule, many-seeded. *Embryo* curved round fleshy endosp.—Herbs or shrubs with altern. simple or binate leaves; stip. 0. Flowers in axillary or terminal cymes.

*** *Flowers irreg. or oblique. Cal. infer. Dorsal stam. often imperfect.or 0. Ovary-cells usually many-ovuled.*

LXXIX. SCROPHULARIACEÆ. *Cal.* infer., 5-lobed or-part. *Cor.* 4-5-lobed, usually 2-lipped, lobes imbr. *Stam.* 4, didymamous, rarely 2 or 5. *Ovary* 2-celled, styles simple, stigmas 2. *Capsule* 2-valved, usually many-seeded. *Seeds* small, endosp. fleshy.—Herbs. Leaves opp. or whorled or the upper rarely altern.; stip. 0. Flowers in racemes or spikes.

LXXX. OROBANCHACEÆ. *Cal.* 5-part. or spathulate. *Cor.-tube* funnel-shaped, lobes 5, imbr., the 2 opp. exterior. *Stam.* 4, didynamous, anth. cohering in pairs, 1-or 2-celled. *Ovary* 1-celled; ovules many, on 2 or 4 parietal placentas. *Capsule* 2-valved, many-seeded.—Herbaceous scapigerous root-parasites. Leaves 0. Fl. racemose.

LXXXI. LENTIBULARIACEÆ. (Utricularia). *Cal.* 2-part. *Cor.* 2-lipped, spurred. *Stam.* 2, on base of cor.; anth. confluent. *Ovary* 1-celled; ovules many, on a free central placenta, style short, stigma 2-lobed. *Capsule* 2-4-valved.—Annual marsh or aquatic herbs. Leaves whorled or altern.

LXXXII. GESNERACEÆ. *Cal.* 5-lobed, valvate. *Cor.* often 2-lipped; lobes 5, imbr. *Stam.* 2-5, often only 2 perf.; anth. more or less confluent. *Ovary* 1-celled; ovules many, on 2 parietal placentas. *Caps.* 2-4-valved, many-seeded.—Herbs with altern. opp. or whorled leaves; stip. 0.

LXXXIII. BIGNONIACEÆ. *Cal.* campan. or spathulate. *Cor.* campanor tubular, 5-lobed. *Stam.* 4, didynamous, or 5. *Disk* cushion-like or annular. *Ovary* 2-celled by confluence of placentas; ovules many. *Caps.* elongate, 2-celled and 2-valved, septum thick. *Seeds* large, winged, endosp. 0.—Trees with opp. compound leaves. Fl. in racemes or panicles.

LXXXIV. PEDALIACEÆ. *Cal.* 5-part. *Cor.* ventricose, sub-2-lipped; lobes 5, imbr. in bud. *Stam.* 4, didynamous, or 5. *Ovary* 1-celled, or 2-4-celled by confluence of pariet. placentas; ovules 2 or more, superposed, stigmas 2. *Fruit* dehiscent (beaked with spines in *Martynia*).—Herbs with opp. or altern. leaves. Fl. axillary, large.

LXXXV. ACANTHACEÆ. *Cal.* 4-5-part., or (in *Thunbergia*) many-part. *Cor.* 2-lipped, or upper lip wanting; lobes imbr. or contorted. *Stam.* 4 or 2; anth. 2-or 1-celled. *Ovary* 2-celled; ovules 1 or more, superposed in each cell, style usually bifid. *Caps.* loculicidal. *Seeds* usually compressed and often hairy.—Herbs or shrubs, with opp. simple exstip. leaves. Inflor. various; fl. often with conspicuous bracts.

**** *Flowers mostly irreg. and 2-lipped. Cal. infer. Ovary-cells 1-ovuled or ovules 2 and collateral. Fruit indehiscent.*

LXXXVI. VERBENACEÆ. *Flowers* reg. or not. *Cal.* 2-or 4-6-part, 2-lipped or not, persist. *Cor.* 4-6-lobed, 2-lipped or not. *Stam.* 4, didynamous, rarely more or 2. *Disk* present. *Ovary* 2-4-celled (1-celled in *Verbena*), cells. 1 2-ovuled. *Fruit* usually a drupe, rarely capsular.—Herbs shrubs or trees, with opp. or ternate simple or compound leaves; stip. 0. Fl. in heads, spikes or racemes.

LXXXVII. LABIATÆ. *Flowers* irreg. *Cal.* 5 rarely 6-10-cleft, persist. *Cor.* 2-lipped or upper lip 0, rarely nearly reg., 4-5-lobed,) *Stam.* 4, didynamous; anth. 1 or 2-celled. *Disk* present. *Ovary* 4-lobed, or of two 2-celled carp.; ovules solitary and erect in each cell; style slender, usually bifid. *Fruit* of 4 small indehiscent nutlets.—Herbs or undershrubs, usually aromatic. Stem usually 4-gonous. Leaves opp. or whorled, stip 0. Fl. in cymes or fascicles or whorled.

An order of doubtful affinity.

LXXXVII. PLANTAGINEÆ. (Plantago). *Fl.* reg. *Cal.* infer.; sepals 4, imbr., persist. *Cor.* scarious, tubular; lobes 4, imbr. *Stam.* 4, on cor.-tube; fil. long, flexuous. *Ovary* 2-celled, with many ovules in each cell. *Caps.* circumsciss. *Seeds* peltate.—Scapigerous perennial herbs. Leaves radical. Fl. in spikes.

DIVISION III. **Monochlamydeæ.** *Perianth* single, rarely 0. Lobes or segments 1-seriate, or if 2-seriate both usually calycine.

Exceptions:—Cor. present in *Loranthus* and in a few of the EUPHORBIACEÆ.—In the genus *Euphorbia* several male-fl. surrounding a single fem.-fl. are inclosed within a common involucre.—In

Ficus the minute 1-sexual fl. are attached to the inner walls of a hollow fleshy receptacle.

1 Ovary 1-celled and 1-ovuled (in Amarantaceæ often 2-or more-ovuled). Embryo annular curved or folded; endosp. mealy or 0.

LXXXIX. NYCTAGINACEÆ (Boerhaavia).—*Fl.* 2-sexual. *Perianth* infer., 5-lobed, coloured, imbr., plaited in bud, tube persist. *Stam.* 1-5, hypog, exserted. *Ovule* erect, style slender. *Fruit* membranous. *Cotyl.* large, folded round the endosp.—Herbs with opp. leaves; stip. 0. Fl. panicled, umbelled or capitate.

XC. AMARANTACEÆ. *Flowers* 1-2-sexual. *Sep.* infer., 5, scarious or herbaceous, imbr., persist *Stam.* 1-5, opp. sep.; fil. distinct, or connate with the interposed staminodes. *Ovary* 1-ovuled (2 or more in *Deeringia* and *Celosia*), ovules basal. *Fruit* usually an indehiscent utricle, rarely a berry. *Seeds* erect.—Herbs or shrubs with opp. or altern. exstip. leaves.

XCI. CHENOPODIACEÆ.—*Flowers* 1-or 2-sexual. *Perianth* infer.; segments 3-5, or in fem.-fl. often 0, distinct or connate, imbr., persist. *Stam.* usually 5, opp. perianth-lobes, hypog. or perig. *Ovary* 1-celled, 1-ovuled, stigmas 2-5. *Fruit* a membranous utricle. *Seed* horiz. or vert.; endosp. mealy, or scanty or 0.—Herbs or undershrubs. Leaves usually altern. Fl. small, axillary.

XCII. POLYGONACEÆ.—*Fl.* 2-sexual. *Perianth* infer., 4-6-cleft, often colo red, imbr., persist. *Stam.* 4-8, perigynous. *Styles* 2 or 3. *Ovule* basal. *Fruit* a 3-gonous or biconvex nutlet. *Embryo* lateral, endosp. floury. —Herbs with altern. leaves, and sheathing stip. Fl. axillary, in heads spikes or cymes, bracteate.

2. Ovary 4-6-celled, many-ovuled. Embryo minute in fleshy endosp.

XCIII. ARISTOLOCHIACEÆ. (Aristolochia). *Flowers* 2-sexual, irreg. *Perianth* super., inflated at base. *Stam.* 6, sessile round the very short style. *Caps.* 6-valved. *Seeds* 3-gonous.—Herbs or shrubs, with altern. exstip. leaves. Fl. axillary.

3. Ovary super., 1-celled and 1-ovuled, or of 3-4 partially connate carpels.

XCIV. PIPERACEÆ. *Flowers* 2-sexual or dicœcious. *Perianth* 0 (in volucre petaloid in *Houttuynia*). *Stam.* 1-6, hypog.; anth.-cells distinct or confluent. *Styles* 2-6, ovule erect. *Fruit* globose or subglobose, dry or succulent (dehiscent in *Houttuynia*). *Embryo* minute, endosp. hard.—Herbs or shrubs, often climbing. Leaves altern. opp. or whorled. Fl. minute, in spikes.

4. Ovary super., 1-celled and 1-ovuled. Stam. on perianth-tube. Seeds with distinct testa.

XCV. LAURACEÆ.—*Flowers* 1-sexual (2-sexual in *Cassytha*). *Perianth.* infer., usually 6-cleft or-part., often persist. *Stam.* usually 9, in 3 rows, with sometimes a 4th inner row of staminodes; fil. flattened, 2-gland., at the base; anth. usually 4-celled (2-celled in *Cassytha*), opening by valves. *Ovule* pend. Fruit indeh. *Endosp.* 0.—Trees or shrubs (*Cassytha* is a leafless climber). Leaves altern. or whorled, rarely opp., entire, stip. 0. Fl. usually in panicles.

XCVI. ELÆAGNACEÆ (Elæagnus). *Flowers* 2 rarely 1-sexual. *Perianth* infer., covered with silvery scales, tube narrow; limb globose, of 4 triangular valvate segments. *Stam.* 4, on mouth of perianth. *Ovule* basal, erect, style long, stigma lateral. *Fruit* indeh., inclosed in the thickened base of perianth-tube. *Cotyl.* thick, endosp. 0. Lepidote shrubs, with altern. entire exstip. leaves. Fl. axillary.

5. Ovary infer., 1-4-ovuled; ovules without apparent coats. Seeds adnate to walls o pericarp.

XCVII. LORANTHACEÆ.—*Flowers* 1-or 2-sexual. *Cal.* super., limb truncate or 0. *Pet.* 3-5, usually long, distinct or connate, valvate. *Stam.* 3-5, opp. and attached to pet *Ovary* 1-celled; ovule 1, erect, adnate to wall of ovary. *Fruit* a 1-seeded berry. *Seed* adnate to pericarp; embryo straight in fleshy endosp.—Tree parasites, often with articulate branches. Leaves opp. or altern. or 0; stipules 0.

XCVIII. SANTALACEÆ (Osyris). *Flowers* small, polygam. *Cal.* super.; segments of limb 3-4, with a tuft of hairs on the face, valvate. *Stam.* 3. opp. perianth segments. *Ovary* 1-celled; ovules 2 or 3, on a free central placenta, pendulous. *Fruit* indeh. *Embryo* axile in copious endosp.—Shrubs with altern. entire exstip. leaves. Fl. axillary.

6. Fl. 1-rarely 2-sexual Ovary of 1 carp. or syncarpous; cells 1-2-ovuled, ovules, if 2 collateral, styles as many as the carpels.

XCIX. EUPHORBIACEÆ. *Perianth* infer., single, rarely double or 0. *Disk* often present. *Stam.* 1, or more. *Ovary* 2-3-celled, cells 1-2-ovuled, ovules pendulous. *Fruit* of 2-3 loculicidal cocci, or a drupe or berry. *Endosp.* fleshy.—Herbs, shrubs or trees, often with milky juice. Leaves altern., simple, rarely opp. or compound, usually stip.

C. URTICACEÆ. *Perianth* infer., lobed or part. *Stam.* as many as and opp. perianth segments or fewer, fil. erect or incurved in bud. *Ovary* 1-2-celled, cells 1-ovuled; style simple or bifid, or stigma sessile. *Fruit* a samara, drupe or achene, or a syncarp of confluent pericarps and perianths. *Seed* erect or pendulous, endosp. scanty or 0.—Herbs, shrubs or trees, often with milky juice. Leaves often oblique, rarely opp. or compound, stipulate. Inflor. various; fl. small or minute, often sunk in a fleshy disk or inclosed in a fleshy receptacle. Male-fl. of *Morus* in catkins.

7. Flowers monœcious; male-fl. in pendulous catkins; fem.-fl. solitary, or in short erect clusters. Ovary infer.

CI. JUGLANDACEÆ (Engelhardtia). MALE-FL.:—*Perianth* of 3-6 scales, adnate to a 3-lobed stipitate bract. *Stam.* 4-12, on the perianth. *Fem.-fl.* solitary and sessile on a 3-lobed bract, stigmas 2. *Fruit* a small globose nut, endocarp 2-valved.—Trees or shrubs, with altern. pinnate exstip. leaves.

CII. CUPULIFERÆ (Quercus).—*Male-fl.* on pendulous catkins. *Perianth* campan., 4-6-lobed. *Stam.* 3-many. *Fem.-fl.* on short erect spikes, each fl. inclosed within an involucre of bracts. *Perianth* tubular adnate to ovary. *Ovary* 3-or 4-5-celled, with 2 ovules in each cell, styles 3-5. *Fruit* a 1-celled nut seated in a cup formed of the hardened imbr. bracts.—Trees with altern. coriaceous leaves, stip. early deciduous.

8. Flowers dioecious, both male and fem.-fl. in catkins, Perianth 0. Ovary super.

CIII. SALICACEÆ (Salix). *Flowers* solitary in the axils of bracts. *Perianth* 0. *Disk* of 1 or 2 glands. *Stam.* 2 or more. *Ovary* 1-celled, style short or 0, ovules few to many. *Fruit* a 2-valved caps. *Seeds* many, with a tuft of long silky hairs from the funicle.—Trees or shrubs, with altern. stip. leaves.

Order of doubtful affinity.

CIV. CERATOPHYLLACEÆ. *Flowers* monœcious; MALE:—*Sep.* 6-12, narrow, bifid, subvalvate in bud. *Stam.* 10-20; anth. oblong, extrorse, connective bicuspidate. FEM.-FL.:—*Sep.* of male. *Ovary* ovoid, 1-celled; style subulate, persist.; ovule 1, pendulous. *Fruit* a compressed coriaceous achene, spinous on margin. *Cotyl.* thick.—Submerged aquatic herbs, with slender much-branched fragile stems. Leaves whorled, cleft into filiform toothed segments.

CLASS II. GYMNOSPERMS.

Trees or shrubs, usually resinous. *Stem* with pith surrounded by concentric layers of wood and bark and increasing in girth as in *Dicotyledons*. *Leaves* usually needle-shaped. *Fl.* 1-sexual. *Perianth* usually 0. *Ovules* not inclosed in an ovary, but attached to the scales (open carpels), or to the axis of a cone. *Seeds* endospermous, cotyledons 2-many.

CV. CONIFERÆ (Pinus). *Flowers* monœcious. *Male-fl.* in spikes; anth. in many series, 2-celled, connective produced. *Fem. cones* with spirally twisted bracts, the ovule-bearing scale larger than the bracts. *Ovules* 2, at the base of the scale and reflexed. *Ripe cone* ovoid or oblong, scales persist. *Seeds* 2, reversed, usually winged.—Evergreen trees with whorled branches. Leaves linear, in clusters of 2, 3 or 5, from the axils of membranous scales.

CLASS III. MONOCOTYLEDONS.

Herbs, rarely shrubs or trees. *Stems* with isolated vascular bundles traversing the cellular tissue. *Leaves* usually parallel-veined. Whorls of *perianth* 3-merous. *Ovules* inclosed in an ovary. *Embryo* with 1 cotyl.: radicle not elongating to form a tap-root, but emitting secondary roots from its crown.

Exceptions.—Net-veined leaves occur in *Dioscorea*, *Smilax*, also in AROIDEÆ and in a few other orders.—The flowers are often 4-merous in NAIADACEÆ, and are occasionally 2-merous in GRAMINEÆ.

DIVISION I. **Petaloideæ.** *Perianth* usually of **6** free or connate segments in 2 series, the inner or both series more or less coloured and petal-like.

Exceptions.—*Flowers* wanting the per. occur in HYDROCHARIDEÆ, TYPHACEÆ, ARACEÆ, LEMNACEÆ and NAIADACEÆ.

SUB-DIVISION 1. **Microspermous.** *Flowers* 1-or 2-sexual. *Per.* super.; segments usually 2-seriate, inner or both corolline. *Ovary* 1-celled, or placentas parietal. *Seeds* many, minute.

CVI. HYDROCHARIDEÆ. *Flowers* 1-sexual, inclosed in spathes. *Sep.* 3. *Pet.* 3 or 0. *Stam.* 3-15, anth. erect. *Ovary* 1-or almost 3-celled; styles or stigmas 3-12. *Fruit* fleshy or membranous.—Aquatic herbs with undivided leaves.

CVII. ORCHIDEÆ. *Flowers* irreg., 2-sexual. *Perianth* 6-part; segments in 2 series, inner or both corolline. *Stam.* usually 1, confluent with the style in a column; anth. 2-celled, pollen-grains cohering in waxy or powdery masses. *Ovary* 1-celled, with 3 parietal placentas, usually twisted. *Caps.* loculicidal.—Herbs or shrubs, often epiphytic.

SUB-DIVISION 2. **Epigynous.** *Flowers* 2-sexual (except *Dioscoreaceæ*). *Perianth* super., in 2 series, one or both corolline. *Ovary* 1-3-celled. *Endosp.* copious.

CVIII. SCITAMINEÆ. *Flowers* irreg., 2-sexual. *Per.* 2-seriate, inner or both petaloid, limb spreading. *Stam.* only 1 fertile. *Ovary* 1-3-celled, style long, stigma often ciliate round the margin. Perennial herbs with penninerved leaves. Inflor. usually spicate. (In *Musa* the fl. 2-sexual the inner perianth is represented by 1 short pet., and there are 5 fertile stam.)

CIX. AMARYLLIDEÆ. *Perianth* super., petaloid; limb 6-lobed or -part., in 2 series. *Stam* 6, on base of per. segments, fil. distinct or connate, anth. erect or versatile. *Ovary* 3-celled, cells many-ovuled. *Fruit* indehiscent, or a capsule opening loculicidally or bursting irregularly. Rootstock bulbous or tuberous. Leaves linear or lanceolate. Scape few or many-flowered.

CX. DIOSCOREACEÆ (Dioscorea). *Flowers* 1 sexual. *Perianth* 6-cleft, in 2 rows. MALE-FL.:—*Stam.* 6, or 3 only perf., on base of per.-segments, anth. oblong or globose. FEM.-FL.: *Staminodes* 3 or 6. *Ovary* 3-gonous, 3-celled, cells 2-ovuled, stigmas 3. *Fruit* a coriaceous 3-winged loculicidal capsule, dehiscing through the wings. Seeds flat, broadly winged.—Twining herbs or shrubs, sometimes prickly. Leaves opp. or altern., simple or 3-5-fol. Inflor. spicate or racemed.

SUB-DIVISION 3. **Coronariæ.** *Flowers* rarely 1-sexual (diœcious in *Smilax*). *Perianth* infer., 6-part., in 2 series, one or both corolline. *Ovary* super., 3-celled.

CXI. LILIACEÆ. *Flowers* 2-sexual. *Perianth* petaloid 6-merous, segments free or connate below. *Stam.* 6, on the per., or hypog., fil. usually free. *Ovary* 3-celled, cells 2-or more-ovuled. *Fruit* a 3-celled berry or capsule. *Seeds* subglobose or flattened; endosp. horny or fleshy, embryo terete.—Herbs, rarely shrubs.

CXII. PONTEDERIACEÆ (Monochoria). *Flowers* 2-sexual, irreg. *Sep.* 3, oblong. *Pet.* large, corolline, obovate, marcescent. *Stam.* 6, on base of

segments, one longest with fil. laterally toothed. *Ovary* 3-celled, cells many-ovuled, style slender. *Caps.* membranous, loculicidally 3-valved. *Seeds* small, endosp. floury, embryo cylindric.—Aquatic herbs, erect, creeping or floating. Leaves often with tumid spongy petioles. Scape erect, from the leaf-sheaths. Fl. in spikes or racemes, blue.

CXIII. COMMELINACEÆ. *Flowers* more or less irreg., 2-sexual. *Perianth* 6-part., in 2 series, marcescent. *Stam.* 6, at the base of the per.-segments, all or 3 only perf., fil. often bearded. *Ovary* 3-celled, cells, 1-few-ovuled, style often bearded and enlarged below the tip. *Caps.* loculicidal. *Endosp.* floury, embryo minute.—Herbs or undershrubs with altern. leaves sheathing at their bases. Fl. in cymes or panicles.

SUB-DIVISION 4. **Calycinæ.** *Perianth* infer., lobes or segments 2-seriate, inner series rarely corolline. *Ovary* super., 1-3-celled. *Endosp.* copious.

CXIV. JUNCACEÆ (Juncus). *Perianth* infer., 6-part., in 2 series, persist., segments narrow. *Stam.* 6 or 3, on bases of per.-segments; anth. erect, basifixed. *Ovary* 1-or 3-celled, many-ovuled, stigmas 3. *Caps.* 1-3-celled, loculicidally 3 valved. *Seeds* many, erect, endosp. hard, embryo small. Annual or perennial herbs with terete or compressed sheathing leaves, or the leaves often reduced to sheaths. Fl. in axillary or term. cymes.

CXV. PALMÆ. *Flowers* mostly 1-sexual. *Perianth* infer., 6-part. or-lobed, in 2 series. *Stam.* usually 6, on base of per., anth. versatile. *Ovary* 1-3-celled, or of three distinct or connate carp., cells 1-2-ovuled.—Shrubs or trees, armed or not. Stem erect, scandent or decumbent. Leaves altern., variously compound. Inflor. various, at first inclosed in a woody or coriaceous spathe. Fl. usually small, green or yellowish.

SUB-DIVISION 5. NUDIFLORÆ. *Perianth* 0, or of scales or bristles. *Ovary* super., 1-2-celled. *Endosp.* usually present.

* *Inflor. inclosed in a (sometimes imperfect) spathe.*

CXVI TYPHACEÆ. *Flowers* monœcious, minute, densely crowded in globose or cylindric 1-sexual bracteate spikes. MALE-FL.:—*Stam.* 1 or more, fil. capillary, anth. basifixed, erect, 2-celled. FEM.-FL.:—*Ovary* 1-2-celled, 1-ovuled (often imperfect in *Typha*). Fruit small membranous or drupaceous (laterally dehiscent in *Typha*). *Endosp.* floury or bony, embryo cylindric.—Aquatic or marsh perennial herbs. Leaves linear, erect or floating.

CXVII. ARACEÆ. *Flowers* small, 1-sexual (2-sexual in *Acorus*), usually on a 2-sexual spadix, with the fem.-fl. below. *Perianth* 0. (of 6 orbicular sep. in *Acorus*). MALE-FL.:—*Anth.* 2-4-celled, free or connate. FEM.-FL.:—*Ovary* sessile, 1-3-celled; cells 1-or more-ovuled. *Fruit* a 1-or few-seeded berry. *Embryo* small, in copious endosp., or macropodous and without endosp.—Terrestrial or aquatic herbs with radical leaves, or suffruticose climbers. Leaves various. Spathe herbaceous, convolute.

Fl. solitary or binate, sunk in the sides or surface of small or minute floating lenticular or globose fronds.

CXVIII. LEMNACEÆ. *Flowers* monœcious, few, most minute, in fissures of the frond, naked or in a sheath. *Perianth* 0. MALE-FL.:—*Stam.* 1 or 2, anth. 1-or 2-celled. FEM.-FL.:—*Ovary* 1-celled, style short, stigma truncate or funnel-shaped; ovules 1 or more. *Fruit* a membranous utricle. *Seeds* ribbed, endosp. 0, embryo cylindric.—Small or minute, gregarious, floating, scale-like, green plants.

SUB-DIVISION 6. **Apocarpous.** *Perianth* 1-2-seriate or 0. *Ovary* super., of 1 or more distinct 1-or more-ovuled carpels. *Endosp.* 0.

CXIX. ALISMACEÆ. *Flowers* 1-or 2-sexual. *Perianth* infer., 6-part., in 2 series. *Sep.* 3, herbaceous, persist. *Pet.* 3, involute in bud, decid. *Stam.* 6-9 or more, hypog. or perig. *Ovary* of few or many distinct carp.; ovules 1 (or many in *Butomopsis*). *Fruit* of small achenes or follicles. *Endosp.* 0, embryo hooked.—Annual or perennial marsh or aquatic plants. Leaves radical, entire. Fl. whorled or umbelled.

CXX. NAIADACEÆ. Fl. 1-or 2-sexual, often inconspicuous, naked or in a sheath. *Perianth* infer., tubular or of 1 or more segments, or 0. *Stam.* 1-4, or 6, hypog.; anth. 1-2-celled. *Ovary* of 1-4 one-ovuled free carp. *Fruit* apocarp. *Endosp.* 0. Embryo macropodous.—Aquatic herbs.

DIVISION II. **Glumiferæ.** *Flowers* in the imbricating bracts of heads or spikelets, 1-or 2-sexual. *Perianth* 0, or of minute scales or bristles, rarely with sheathing bracteoles (2-seriate in *Eriocauloneæ*). *Ovary* super., 1-celled and 1-ovuled, or in *Eriocauloneæ*, of three 1-ovuled cells. *Endosp.* copious.

CXXI. ERIOCAULONEÆ. *Flowers* minute, in involucrate heads, 1-sexual *Perianth* usually of 6 membranous sep. in 2 series. *Stam.* 6 or fewer *Ovary* super., 3-lobed, 3-celled. *Fruit* a membranous loculicidally 3-valved capsule.—Scapigerous herbs with narrow leaves.

CXXII. CYPERACEÆ. *Flowers* in spikelets of imbr. bracts (glumes). 1-or 2-sexual. *Per.* 0, or of hypog.-scales or bristles. *Stam.* 1-3, anth. basifixed. *Ovary* super. (included in an utricle in *Carex*), style 1, stigmas 2-3 ovule erect. *Fruit* indeh. *Embryo* in base of copious endosp.—Grass-like herbs with terete or 3-angled stems. Leaves narrow, sheaths entire.

CXXIII. GRAMINEÆ.—*Flowers* in spikelets of imbr. bracts (glumes) 1-or 2-sexual. *Per.* of 2 or more minute hypog.-scales (*lodicules*), or 0. *Stam.* 3, rarely 1, 2 or more, anth. versatile. *Ovary* super.; styles 2, rarely 1, distinct or united below, stigmas penniciliate or feathery, ovule erect. *Fruit* indeh. *Seed* usually adherent to the membranous or coriaceous pericarp; embryo towards the base and side of copious endosp.—Grasses, mostly herbs (shruby or arboreous in *Bambuseæ*). Stem terete or compressed. Leaves usually narrow; sheath split to the base, distinct from the blade and with a membrane or ridge of hairs (*ligule*) at the junction.

Flora of the Upper Gangetic Plain,

and of the adjacent

Siwalik and Sub-Himalayan tracts.

I.—RANUNCULACEÆ.

ANNUAL or perennial herbs, rarely shrubs. *Leaves* radical or alternate (opposite in *Clematis*). *Stipules* 0, or adnate to the petiole, rarely free. *Flowers* regular or irregular, 1- or 2-sexual, rarely bracteate. *Sepals* 5 or more, rarely 2-4, usually deciduous, often petaloid, imbricate (valvate in *Clematis*). *Petals* 0, or 3-5 or more, imbricate, often minute or deformed. *Anthers* usually adnate and dehiscing laterally. *Carpels* usually many, free, 1-celled; stigma simple; ovules 1 or more, on the ventral suture. *Fruit* of numerous 1-seeded achenes, or many-seeded follicles, rarely a berry. *Seeds* small, albuminous.

The majority of the Indian species of this rather large family are confined to the Himalayan ranges, and belong to genera which are represented in European gardens by many familiar ornamental plants, such as:—*Anemone*, *Columbine*, *Larkspur*, *Monkshood*, *Pœony*, etc. Nearly all the species possess a more or less acrid juice, and some of them are extremely poisonous. Nigella sativa, *L.*, Vern. *Kálajira*, is occasionally found in native gardens, its seeds being used both as a condiment and medicinally.

Climbing shrubs with opposite leaves, sepals petal-like, valvate, petals 0 . . .	1. CLEMATIS.
Herbs with alternate leaves, sepals imbricate.	
Sepals petal-like, petals 0	2. THALICTRUM.
Sepals herbaceous, petals 5	3. RANUNCULUS.

1. CLEMATIS, Linn.; Fl. Br. Ind. i. 2.

Usually woody climbers. *Leaves* opposite, usually compound, exstipulate, petioles often twining. *Inflorescence* axillary or terminal. *Sepals* usually 4, petaloid, valvate. *Petals* 0. *Stamens* many. *Carpels* many, each with 1 pendulous ovule. *Fruit* a head of sessile or stalked achenes, each with usually a long feathery style.

Sepals spreading from the base, fil. glabrous	1. *C. Gouriana.*
Sepals erect with recurved tips, fil. hairy .	2. *C. nutans.*

1. **C. Gouriana,** *Roxb. Fl. Ind. ii. 670; W. & A. Prod 2; Royle Ill. 51; Hk. f. & T. Fl. Ind. 8; F. B. I. i. 4; Watt E. D.* Vern. *Belkun* (Dehra Dun).

An extensive climber, usually glabrous; young parts pubescent. *Leaves* pinnate, 2-pinnate or 2-ternate; *leaflets* membranous, ovate-oblong or cordate, acuminate, shining above, sometimes pubescent beneath. *Flowers* small, in dense panicles, yellowish or greenish-white. *Sepals* spreading from the base, obovate or oblong, puberulous. *Filaments* glabrous. *Achenes* narrowly oblong, hairy.

Dehra Dun. DISTRIB.: Punjab Hills and West Himalaya up to 5,000 ft., extending to Ceylon, the Malay Peninsula, Java and the Philippines. This species, though very variable in regard to its foliage, closely resembles the European *C. Vitalba*, the well-known "Traveller's Joy." The specific name given by Roxburgh refers to *Gour*, the ancient capital of Bengal, amongst the ruins of which this plant is abundant. It begins to flower towards the end of the rainy season.

2. **C. nutans,** *Royle Ill. 51; Hk. f. & T. Fl. Ind. 10; F. B. I. i. 5.* Vern. *Nákchhikni* (Dehra Dun).

A slender silkily pubescent woody climber with furrowed stems. *Leaves* decompoundly pinnate; *leaflets* 1-3 in., ovate oblong or lanceolate, acutely or obtusely 3-5-lobed, rarely entire. *Flowers* large, in much-branched panicles, pale yellow. *Sepals* erect, with recurved tips, oblong, many-nerved, silky outside. *Filaments* hairy towards the base. *Achenes* large, ovate, silky.

Dehra Dun, in shady ravines. DISTRIB.: West Himalaya, from the Sutlej to Kumaon, up to 5,000 ft.; Parasnáth in Behár; Chota Nagpur; Khasia Hills. The flowers appear at the beginning of the cold season.

2. THALICTRUM, Linn.; Fl. Br. Ind. i. 10.

Erect, usually rigid, perennial herbs. *Leaves* compound; *petioles* sheathing, often auricled or stipuled. *Flowers* in panicles or racemes, often polygamous. *Sepals* 4-5, imbricate, petaloid. *Petals* 0. *Stamens* many. *Carpels* few or many; ovule 1, pendulous. *Fruit* a small head of sessile or stalked achenes.

Leaves ternately decompound, anthers not pointed 1. *T. javanicum.*

Leaves pinnately decompound, anthers pointed . 2. *T. foliolosum.*

1. **T. javanicum,** *Blume Bijdr. 2; F. B. I. i. 13.* T. glyphocarpum, *W. & A. Prod. 2; Hk. f. & T. Fl. Ind. 16.*

Stems 2-3 ft., erect, glabrous. *Leaves* ternately divided, with auricled sheaths; *leaflets* ½-1½ in. long, orbicular or oval, obtusely 3-7-toothed at the apex, base rounded or cordate, glaucous beneath; *stipules* adnate to the petioles, membranous, fimbriate. *Flowers* small, white, often clustered at the ends of the panicle branches. *Filaments* club-shaped; *anthers*

not pointed. *Achenes* large, oblong, with a short hooked beak, strongly ribbed.

Dehra Dun. DISTRIB: West Himalaya, from Simla to Sikkim, up to 2,000 ft.; Khasia Hills; Parasnáth in Behár; Chota Nagpur, and south to Ceylon and Java.

2. **T. foliolosum,** *D C. Syst. i. 175; Royle Ill. 51; Hk. f. & T. Fl. Ind. 16; F. B. I. i 14; Watt E. D.* Vern. *Shuprak.*

Stems 4-8 ft. high, glabrous. *Leaves* pinnately decompound, with auricled sheaths; *leaflets* orbicular, without stipels. *Flowers* in much-branched panicles, polygamous, white, pale green or dingy purple. *Anthers* pointed. *Achenes* acute at each end, sharply ribbed.

Dehra Dun. DISTRIB.: Abundant throughout the Temperate Himalaya up to 9,000 ft., also on the Khasia Hills. The root, *mamira*, is much valued as a native remedy for ophthalmia, and also as a febrifuge.

3. RANUNCULUS, Linn.; Fl. Br. Ind. i. 16.

Annual or perennial herbs. *Leaves* entire lobed or dissected. *Stipules* membranous or 0. *Flowers* usually panicled, white or yellow. *Sepals* 3-5, herbaceous, caducous, imbricate in bud. *Petals* usually 5, rarely 0, often glandular near the base. *Stamens* many. *Carpels* many, styles short; ovule 1, ascending. *Fruit* a head or spike of beaked or apiculate achenes. To this genus belong the common English Buttercups (*R. bulbosus, acris,* and *repens*).

An aquatic plant with white flowers . . 1. *R. aquatilis.*

Flowers yellow—

Glabrous; achenes turgid, not margined 2. *R. sceleratus.*

Hairy; achenes flattened and with an intramarginal rib . . . . . 3. *R. pensylvanicus.*

1. **R. aquatilis,** *Linn. Sp. Pl. 556; Var.* trichophyllus, *Chaix (sp.) F. B. I. i. 16* R. aquatilis, L. (in part); *Don in Royle Ill. 54; Hk.f. & T. Fl. Ind. 29; Watt E. D.* (Water crow-foot.)

Leaves all submerged, segments thread-like; *stipules* ½-adnate, auricled. *Flowers* shortly peduncled, usually small, white. Stamens few. Achenes in globular heads, transversely wrinkled.

Occasionally in the Gangetic Plain as far south as Saharanpur and Delhi. DISTRIB.: Punjab Plain; West Himalaya from the Indus to Kumaon, up to considerable elevations, extending through Baluchistan and Afghanistan to Europe, where many varieties occur: also in N. Asia, and in temperate parts of the S. Hemisphere. Floating leaves never occur in the Indian plant. The acrid and unwholesome properties characteristic of *Ranunculaceæ* are not found in this species.

2. **R. sceleratus,** *Linn. Sp. Pl. 551; Royle. Ill. 53; Hk. f. & T. Fl. Ind. 35; F. B. I. . 19; Watt E. D.* R. indicus, *Roxb. Fl. Ind. ii. 671.* (Cedery-leaved crow-foot.)

An erect glabrous annual. *Stem* 1-3 ft., often stout fleshy and branched, rarely puberulous above. *Leaves* 3-lobed or -partite; lower petioled, 3-partite, with obovate cuneate segments; upper trifid, with linear segments; stipules membranous. *Flowers* rather small, yellow. *Calyx* reflexed, often woolly outside. *Petals* oblong. *Achenes* numerous, in oblong heads, turgid not margined, obliquely obovate, obtuse or very shortly mucronate. *Receptacle* oblong, pilose.

Abundant throughout the area in wet ground. DISTRIB.: Punjab and Bengal plains, and warm valleys of the Himalaya up to 5,000 ft., extending to Europe and N. Asia. The whole plant is extremely acrid, and is often used by the natives as a vesicant.

3. **R. pensylvanicus**, *Linn. f. Suppl. 272; F. B. I. i. 19.* R. fibrosus, *Wall.; Hk. f. & T. Fl. Ind. 37.* R. chinensis, *Bunge; Hk. f. & T. l. c. 38.* R. riparius, *Edgew. in Trans. Linn. Soc. XX, 28.*

An erect hairy annual. *Stem* 2-3 ft., prostrate at the base and often rooting at the nodes, patently hairy. *Leaves* 3-partite, segments deeply divided; lower on long petioles; leaflets long-stalked and deeply cut into linear segments; upper sessile or nearly so. *Flowers* about 1 in. in diam., yellow. *Sepals* reflexed. *Receptacle* pilose. Very variable in the shape of the head of achenes, and in the prominence and position of the intra-marginal rib.

In the Kheri district of N. Oudh, in wet ground; banks of the Ganges near Bhojpur (Edgeworth). DISTRIB.: Ludhiana, on the banks of the Sutlej (Edgeworth); Nepal Terai; Khasia Hills, up to 6,000 ft., extending to N. China, Amur-land, and N. America.

II.—DILLENIACEÆ.

TREES, shrubs or herbs, sometimes climbing. *Leaves* alternate, simple, entire or toothed, usually with exstipulate sheathing petioles. *Flowers* yellow or white, often showy. *Sepals* 5, imbricate, persistent. *Petals* usually 5, deciduous. *Stamens* many, in several series. *Carpel* 1 or more, free or cohering in the axis; styles distinct. *Fruit* of follicles, or indehiscent and sub-baccate. *Seeds* arillate (except in *Dillenia*); albumen fleshy. Chiefly tropical, also largely represented in Australia.

DILLENIA, Linn.; Fl. Br. Ind. i. 36.

Trees. *Leaves* broad, with conspicuous parallel lateral nerves. *Flowers* large, solitary or fascicled, yellow or white. *Sepals* 5, spreading. *Petals* 5, broad. *Stamens* nearly free; *anthers* linear, bursting by small slits or pores; inner introrse, outer extrorse. *Carpels* 5-20, cohering in the axis; ovules indefinite. *Fruit* globose,

formed of the matured indehiscent carpels inclosed in the thickened cup. *Seeds* naked or immersed in pulp; aril none.

Flowers white, appearing with the leaves, seeds hairy	1. *D. indica.*
Flowers yellow, appearing before the leaves, seeds glabrous—	
Flowers solitary	2. *D. aurea.*
Flowers fasiccled	3. *D. pentagyna.*

1. **D. indica,** *Linn. Sp. Pl. 535; F. B. I. i. 36; Brand. For. Fl. 1.* D. speciosa, *Thunb; Roxb. Fl. Ind. ii. 650; W. & A. Prod. 5; Royle Ill. 58; Hk. f. & T. Fl. Ind. 69; D. & G. Bomb. Fl. 2. Watt E. D.* Vern. *Chaltr.*

A handsome evergreen round-headed medium-sized tree. *Leaves* oblong, lanceolate, serrate *Flowers* large, solitary, subterminal, white, appearing with the leaves *Sepals* fleshy. *Seeds* many, hairy.

Tropical forests at the base of the Himalaya from Nepal to Assam (possibly wild in N. Oudh); Bengal, S. India, Ceylon, Burma, Malay Peninsula and Archipelago. Cultivated in most Indian gardens in the plains. The fragrant flowers open during June and July, and the round hard apple-like fruits ripen during the cold season. The acid calyx surrounding the ripe carpels is eaten raw or cooked in curries, and is also used for making a jelly.

2. **D. aurea,** *Smith Exot. Bot. ii. 65, t. 92; Hk. f. & T. Fl. Ind. 70; Royle Ill. 58; F. B. I. i. 37; Brand. For. Fl. 2; Watt E. D.* Vern. *Aggai* (Oudh).

A small tree in Oudh, rarely over 2 ft. in girth, and 20 ft. high. *Leaves* deciduous, about 1 ft. long, oblong or obovate, tapering into the deeply channelled sheathing petioles, crenate-dentate, rufous-silky on both sides when young, glabrous above when old. *Flowers* 2-3 in. across, with ovate bracts at the base of the peduncle, large, solitary, golden yellow, terminating lateral branches, appearing before the leaves. *Sepals* fleshy, oblong, obtuse, glaucous, silky when young. *Carpels* 6-12, inclosed in the fleshy calyx. *Fruit* about the size of a small apple. *Seeds* many, glabrous, surrounded by viscid pulp.

Forests of N. Oudh. DISTRIB.: Base of Himalaya, from Nepal to Bhutan; Burma, Malay Peninsula, Andaman Islands, Java, Borneo. The new foliage appears in April, after the flowers have opened. Wood grey, beautifully mottled.

3. **D. pentagyna,** *Roxb. Cor. Pl. 1, 21, t 20; Fl. Ind. ii. 652; W. & A. Prod. 5; Hk. f. & T. Fl Ind. 71; D. & G. Bomb. Fl. 2; F. B. I. i, 38; Brand For. Fl. 2. Watt E. D.* D. augusta and D. pilosa, *Roxb. l. c.* Vern. *Aggai.*

A moderate-sized tree. *Branches* ascending and drooping at the ends, rough and scarred when old; young parts silky. *Leaves* deciduous, 1-2 ft long, oblong-lanceolate, denticulate, decurrent into short winged

sheathing petioles. *Flowers* 5-8, loosely fascicled on the 2-3-year-old branches, about 1 in. in diam., appearing before the leaves, yellow, sweet-scented. *Sepals* ovate, obtuse, glabrous. *Petals* oblong or obovate. *Carpels* 5. *Fruit* pendulous, about the size of a gooseberry.

Sal forests of Rohilkhand, Oudh, and Gorakhpur. DISTRIB.: Base of Himalaya from Nepal to Assam, Bengal, Central Provinces, S. India, Burma. The old leaves are shed during March and April, and the flowers appear soon afterwards; ripe fruit in May. The pleasantly acid flower-buds and young fruit are eaten raw or cooked; the ripe fruit is also eaten. The old rough leaves are much used for polishing ivory, etc.

No indigenous member of the allied family *Magnoliaceæ* is represented in the Upper Gangetic Plain, but the following well-known and extensively cultivated tree should be mentioned:—Michelia Champaca, *Linn. Sp. Pl. 536; Roxb. Fl. Ind. ii. 656; W. & A. Prod. 6; Royle Ill 58; Hk. f. & T. Fl. Ind. 79; F. B. I. i. 42; Brand. For. Fl. 3; Watt E. D. King in Ann. R. Bot. Gard. Calc. iii, part 2, 216.* The Champak tree. Vern. *Champa.* A tall handsome evergreen tree with sweet-scented yellow flowers. It has been planted in many parts of the area, especially near temples. On the Himalaya it is found up to 5,400 feet. Believed to be indigenous in the forests of the Straits Settlements, and in Java. It flowers during the hot and rainy seasons. The beautifully mottled heartwood is much valued.

III.—ANONACEÆ.

TREES or shrubs, often climbing. *Leaves* alternate, exstipulate, simple, entire. *Flowers* usually 2-sexual. *Sepals* 3, free or connate, usually valvate. *Petals* 6, in 2 series, or the inner absent. *Stamens* usually many, closely packed on the torus; *filaments* short or 0, *anthers* adnate, connective produced into an oblong dilated or truncate head. *Ovaries* usually indefinite, apocarpous (syncarpous in *Anona*); *style* short or 0; *ovules* 1 or more. *Fruit* of 1 or more sessile or stalked 1- or many-seeded usually indehiscent carpels. *Seeds* large, with dense ruminate albumen; embryo small. Species nearly all tropical, often aromatic.

Artabotrys odoratissima, R. Br., a glabrous evergreen shrub with strongly scented yellow flowers, is cultivated in many gardens in Northern India. It is indigenous in S. India and Ceylon.

Outer petals much longer than the sepals.
- Ripe carpels distinct, 1-seeded . . . . 1. POLYALTHIA.
- Ripe carpels connate in a fleshy many-seeded fruit . . . . . 2. ANONA.

Outer petals small and like the sepals.
- Inner petals flat, ovules 1 or 2 . . . . 3. MILIUSA.
- Inner petals saccate at the base, ovules 6 or more . . . . . 4. SACCOPETALUM.

1. POLYALTHIA, Blume; Fl. Br. Ind. i. 62.

Trees or shrubs. *Sepals* 3, valvate or subimbricate. *Petals* 6, in 2 series, ovate or elongated, flat or the inner vaulted. *Torus* convex. *Stamens* cuneate; anther-cells extrorse, remote. *Ovaries* indefinite, *style* usually oblong; *ovules* 1-2. *Fruit* consisting of 1 or many dry or fleshy stalked 1-seeded carpels —Tropical regions, chiefly of the Old World.

P. suberosa, *Benth. & Hk. f. in F. B. I. i. 65; Brand. For. Fl. 5; Watt E. D.; King in Ann. R. Bot. Gard. Calc. iv, 64. t. 77B.* Uvaria suberosa, *Roxb.; Fl Ind. ii,* 667. Guatteria suberosa, *Dun; W. & A. Prod. 10; Hk. f. & T. Fl. Ind. 140.*

An evergreen shrub or small tree. *Branches* rufous-tomentose when young, becoming corky and rugged in age. *Leaves* 2-5 in. long, shortly petioled, oblong, obtuse, slightly narrowed to the somewhat oblique base; membranous, glabrous and shining above, pubescent beneath when young; main nerves about 6 pairs, rather faint. *Flowers* ¾ in. in diam., greenish-white, on slender pedicels, usually solitary and extra-axillary; pedicels with an acuminate bract near the base. *Sepals* less than half the size of the petals, spreading, pubescent. *Petals* oval, reddish-brown, silky outside, the outer shorter. *Carpels* stalked, subspherical, silky when young, ¼ in. in diam. *Seeds* roundish, smooth.

Oudh Forests. DISTRIB.: Bengal, S. India, Ceylon. The tree is in flower during the greater portion of the year.

P. longifolia, *Benth. and Hk. f. in F. B. I. i. 62; Brand. For. Fl. 4: Watt E. D.; King in Ann. R. Bot. Gard. Calc. iv, 72, t. 99. Guatteria longifolia, Wall.; W. & A. Prod. 10; Hk. f. & T. Fl. Ind. 139. Uvaria longifolia, L.; Roxb. Fl. Ind. ii. 664; Royle Ill., 59.* Vern *Debdar* (N. India), *Asok* (S. India) A handsome evergreen tree with lanceolate acuminate shining undulate leaves. Although indigenous only in S. India and Ceylon, it thrives well in the gardens of Upper India, and has proved a very suitable tree for avenues, of which some fine examples may be seen in the R. Botanic Garden at Calcutta. The sacred character of this tree, as implied by some of its vernacular names, accounts for its often being met with near temples.

2. ANONA, Linn.: Fl. Br. Ind. i. 78.

Trees or shrubs. *Flowers* 2-sexual, solitary or fascicled, terminal or leaf-opposed. *Sepals* 3, small, valvate. *Petals* 3 or 6, valvate. *Stamens* many, top of connective ovoid. *Ovaries* many, subcounate; *ovule* solitary. Ripe *carpels* confluent into a many-celled ovoid or globose many-seeded fruit.

A. squamosa, *Linn. Sp. Pl. 537; Roxb. Fl. Ind. ii. 657; W. & A. Prod. 7; Royle Ill. 60; Hk. f. & T. Fl. Ind. 115; F. B. I. i. 78; Brand. For. Fl. 6. Watt E. D.* (Custard-Apple, or Sweet-Sop of America). Vern. *Sharifa, Sitaphal.*

A shrub or small tree, nearly evergreen. *Leaves* 2-3 in. long, stalked, oblong or oblong-lanceolate, obtuse or acuminate, base acute, glaucous beneath, pubescent when young. *Flowers* stalked, inserted on short branchlets. *Sepals* triangular, acute, united at the base. Outer *petals* 1 in. long, fleshy, inner minute or wanting. *Fruit* 2-4 in. across, yellowish-green, tubercled. *Seeds* oblong, brownish black, with a pale swelling at the hilum.

A native of Tropical America and the West Indies. It is extensively cultivated for its fruit in the hotter parts of India, and has so far become naturalized in Bundelkhand, the Central Provinces, and other places, especially in the neighbourhood of old forts, as to have often the appearance of being indigenous to the country. The flowers appear early in the hot weather, and the fruit ripens July-Sep.

Anona reticulata, L., Bullock's Heart, or Custard-Apple of the West Indies; and *A. muricata*, L. (Sour-Sop), are occasionally met with in Indian gardens. The former is the more abundant, and is becoming naturalized in many places.

3. MILIUSA, Leschen., Fl. Br. Ind. i. 86.

Trees or shrubs. *Flowers* usually 2-sexual. *Sepals* 3, small, valvate. *Petals* 6, valvate, in two series, outer smaller and like the sepals, inner thin and cohering when young by their margins. *Torus* elongated, cylindric. *Anther*-cells contiguous, extrorse; connective more or less apiculate. *Ovaries* indefinite, linear-oblong; *ovules* usually 1 or 2, rarely more. Ripe *carpels* globose or oblong, 1-many-seeded.

M. velutina, *Hk. f. & T. Fl. Ind. 151; Brand. For. Fl. 6; F. B. I. i. 87; Watt E. D.*; *King in Ann. R. Bot. Gard. Calc. iv. 158, t. 205A.* Uvaria villosa, *Roxb. Fl. Ind. ii. 664.* Guatteria velutina, *Dun.*; *Royle Ill. 59.* Vern. *Gidar-rukh*, *Dom-sál* (N.-W. P.), *Bari kári* (Oudh).

A medium-sized tree. Young branches and leaves densely tomentose when young. *Leaves* shortly petioled, thickly membranous, variable in size, ovate-oblong or subrotund, minutely apiculate, obtuse or acute, rounded or slightly cordate at the base, both surfaces pale tomentose; main nerves 8-12 pairs, rather prominent on both surfaces. *Flowers* up to ½ in. long, on slender tomentose pedicels, solitary, or 2-3 from a shorter tomentose leaf-opposed peduncle. *Sepals* and outer *petals* small, ovate; inner *petals* much larger, blackish purple, glabrous inside. *Stamens* short, slightly apiculate. *Ovaries* ovoid, pubescent, 2-ovuled. *Stigma* subsessile. Ripe *carpels* puberulous, bluish purple, ½-¾ in. in diam. *Seeds* 2.

Dehra Dun and Siwalik range, Rohilkhand, Oudh, and Gorakhpur forests. DISTRIB.: Bengal, Central Provinces, Burma. The tree is leafless during the early part of the hot weather. Fl. March to May; fr. June and July. The leaves are much used as fodder.

4. SACCOPETALUM, Bennett; Fl. Br Ind. i. 88.

Trees. *Leaves* deciduous. *Flowers* 2-sexual. *Sepals* 3, small, valvate. *Petals* 6, valvate, in two series, outer small and like the sepals; inner much larger, erect or conniving, saccate at the base. *Stamens* indefinite; *anther*-cells contiguous, connective produced into a conspicuous appendage. *Ovaries* many; *ovules* 6 or more. Ripe *carpels* sub-globose

S. tomentosum, *Hk. f. & T Fl. Ind. 152; D. & G. Bomb. Fl. 4; F. B. I. i. 88; Brand. For. Fl. 7; Watt E. D.; King in Ann. R. Bot. Gard. Calc. iv. 159, t. 207.* Uvaria tomentosa, *Roxb; Fl. Ind. iii. 667; W. & A. Prod 8.* Vern. *Karri* (Oudh).

A large tree, young branches tomentose. *Leaves* 6-12 in. long, shortly petioled, thickly membranous, ovate or ovate-oblong, sub-acute or rounded at the base; upper surface, except the midrib, glabrous or nearly so, pubescent or tomentose beneath when young; main nerves 6-11 pairs, prominent beneath. *Flowers* 1 in. in diam., leaf-opposed or subterminal, solitary or in pairs; pedicels slender, bracteate at the base. *Sepals* and outer *petals* minute, subequal, lanceolate, reflexed, pubescent; inner *petals* much larger, ovate-oblong, obtuse, saccate at the base. *Stamens* many, in several rows, minutely apiculate. *Ovaries* ovate, pointed, hirsute at the base; *ovules* about 6, in two rows; *stigma* sessile. Ripe *carpels* globose, tapering to the base, pubescent, dark purple, 1 in. in diam.

Dehra Dun and Siwalik range; forests of Oudh. DISTRIB.: Southward from Behar and Konkan to Travancore. The leaves turn to an orange-yellow colour before falling in March, the flowers appearing with the new leaves in April; fruit ripens in June. The leaves are used as fodder.

IV.—MENISPERMACEÆ.

CLIMBING or twining rarely erect shrubs. *Leaves* alternate, entire or lobed; *stipules* 0. *Flowers* small, diœcious or polygamous. *Sepals* usually 6, free, imbricate, in 2 series, outer often minute. *Petals* usually 6, or wanting. MALE fl.: *Stamens* hypogynous, usually 1 opp. each petal; *filaments* free or connate; rudimentary carpels small or 0 FEM. fl.: Staminodes 6 or 0. *Ovaries* usually 3; *ovules* generally solitary. Ripe *carpels* drupaceous, with the style-scar subterminal, or by eccentric growth near the base *Seed* curved or reniform; albumen even or ruminate or none.—Species nearly all tropical

For an account of the peculiar structure of the wood in this family see Brandis For. Fl. p 10. The plants of this family ar

romarkable for their bitter and narcotic properties, and many of them are valued medicinally.

Carpels 3 or more.

Seed ovoid or reniform.

Style-scar subterminal; pet. 6; stam. distinct . 1. TINOSPORA.

Style-scar lateral or subbasal; pet. 0; stam. 1-adelphous . . . . . 2. ANAMIRTA.

Seed horseshoe-shaped or hooked.

Styles subulate.

Dry fruit not tubercled; albumen ruminate . 3. TILIACORA.

Dry fruit tubercled; albumen not ruminate . 4. COCCULUS.

Styles forked . . . . . 5. PERICAMPYLUS.

Carpels solitary.

Sep. of male fl. 6; pet. distinct . . . . 6. STEPHANIA.

Sep. of male fl. 4; pet. connate . . . . 7. CISSAMPELOS.

1. TINOSPORA, Miers; Fl. Br. Ind. i. 96.

Climbing shrubs. *Flowers* in axillary or terminal racemes or panicles. *Sepals* 6, 2-seriate; inner larger, membranous. *Petals* 6, smaller. MALE fl.: *Stam.* 6; *filaments* free, tips thickened; *anther*-cells obliquely adnate. FEM. fl. *Staminodes* 6, clavate. *Ovaries* 3; stigmas forked. *Drupes* 1-3; style-scar subterminal; endocarp rugose. *Seed* grooved ventrally, or curved round the intruded and 2-lobed endocarp; albumen ventrally ruminate.

T. cordifolia, *Miers in Ann. & Mag. Nat. Hist. Ser. II, vii (1851) 38; Hk. f. & T. Fl. Ind. 184; D. & G. Bomb. Fl 5; F. B. I. i, 97; Brand. For. Fl. 8; Watt E. D.* Menispermum cordifolium, Willd.; *Roxb. Fl. Ind. iii, 811.* Cocculus cordifolius, *DC.; W. & A. Prod. 12; Royle Ill. 61.* Vern. *Gulel, guloh, gulancha.*

A glabrous climbing succulent shrub with rough corky bark. *Leaves* petioled, 2-4 in. in diam., cordate, acute or acuminate, glabrous. *Flowers* small, yellow. MALE fl. in fascicles. *Sepals* oval. *Petals* ½ the length of the sepals, wedge-shaped *Anther*-cells immersed in the fleshy summit of the filament FEM. fl. usually solitary *Sepals* and *petals* as in the male. *Ovaries* on a fleshy receptacle; *style* very short. Ripe *carpels* pisiform, red.

Dehra Dun, Oudh, Merwára, Bundelkhand, common in hedges. DISTRIB. throughout Trop. India, also in Burma and Ceylon. Flowers in the hot and rainy seasons The roots and stems (*gulancha*) are much used medicinally. Long filiform aerial roots are frequently developed from the branches.

2. ANAMIRTA, Colebr.; Fl. Br. Ind. i. 98.

Woody climbers. *Flowers* in panicles. *Sepals* 6, with 2 appressed bracts. *Petals* 0. MALE fl.: *Anthers* sessile, on a stout column, 2-celled, bursting transversely. FEM. fl.: *Staminodes* 9, clavate, 1-seriate. *Ovaries* 3, on a short gynophore; *stigma* subcapitate, reflexed. *Drupes* on a 3-fid gynophore, obliquely ovoid, dorsally gibbous; *style-scar* subbasal; endocarp woody. *Seed* globose, embracing the subglobose hollow intruded endocarp; albumen dense, of horny granules; embryo curved. —Trop. Asia.

A. paniculata, *Colebr. in Trans. Linn. Soc. xiii, 661.* A. Cocculus, *W. & A. Prod. 446; Hk. f. & T. Fl. Ind. 185; F. B I. i. 98; Brand. For. Fl. 8; Watt E.D.* Menispermum Cocculus. *Linn.; Roxb. Fl. Ind. iii, 807.* M. heteroclitum, *Roxb. l. c. 817.* Cocculus suberosus, *W. & A. Prod. 11; Royle Ill. 61.* Vern. *Kakmári.*

A large woody climber with corky bark. *Leaves* 4-8 in. long, broadly ovate, acute or obtuse, rounded or subcordate at the base, thinly coriaceous, glabrous above, paler and with small tufts of hairs in the axils of the veins beneath; petioles thickened and prehensile at the lower ends. *Flowers* from the old wood, ¼ in. in diam, pale greenish-yellow, sweet-scented. *Sepals* imbricate, ultimately reflexed. Ripe *carpels* subglobose, ½ in., smooth, black.

Forests of N. Oudh (R. Thompson). DISTRIB.: E Bengal; S. India to Ceylon and Malay Archipelago. The bitter berries of this plant, known as, 'Cocculus indicus,' are used in India for intoxicating fish and crows and in England for the adulteration of beer.

3. TILIACORA, Colebr.; Fl. Br. Ind. i. 99.

An evergreen climbing shrub. *Flowers* in axillary panicles, diœcious or polygamous. *Sepals* 6, 2-seriate, outer much smaller. *Petals* 6, minute, cuneate. MALE fl.: *Stamens* 6, *filaments* subcylindric; *anthers* adnate. FEM. fl.: *Ovaries* 3-12; style-scar subbasal. *Seed* hooked; albumen ruminate; cotyledons linear. —A single species.

T. racemosa, *Colebr. in Trans Linn. Soc. xviii. 67; F. B. I. i. 99; Brand. For. Fl. 10; Watt E. D.* T. acuminata, *Miers; Hk. f. & T. Fl. Ind. 187.* Menispermum polycarpum, *Roxb. Fl. Ind. iii, 816.* Cocculus acuminatus, *W. & A. Prod. 12.* Vern. *Karwanth, rangoe* (Oudh), *tiliakora* (Beng.).

Young shoots glabrous. *Leaves* 4-5 in., ovate or ovate-cordate, acuminate, somewhat 3-veined, undulate, glabrous, dark green; petiole ¾-1 in., slender. *Panicles* 6-12 in., hoary, at length glabrous; male branches 3-7-flowered; fem. simple, 1-flowered. *Flowers* ¼ in.,

yellow. Ripe *carpels* 1-10, ½ in., smooth, red or yellow; endocarp wrinkled. *Seed* bent double.

Oudh forests. DISTRIB.: Bengal to Orissa and Konkan; Ceylon; Singapore; Java. The long flexible branches are used for thatching and for basket work.

4. COCCULUS, DC.; Fl. Br. Ind. i. 101.

Climbing or sarmentose shrubs, rarely suberect. *Petiole* not dilated at the base. *Flowers* panicled. *Sepals* 6, 2-seriate, outer smaller. *Petals* 6, smaller than the sepals, usually auricled. MALE fl.: *Stamens* embraced by the petals; *anthers* subglobose, cells bursting transversely. FEM. fl.: *Staminodes* 6 or 0. *Ovaries* 3-6; *styles* usually cylindric. *Drupes* laterally compressed; endocarp horseshoe-shaped, dorsally keeled and tubercled, sides excavate. *Seed* curved; albumen fleshy; embryo annular —In all warm climates.

A small tree with glabrous shining coriaceous leaves 1. *C. laurifolius.*

Climbing shrubs—

Leaves villous and green	2. *C. villosus.*
Leaves glabrous, glaucous	3. *C. Leœba.*

1. C. laurifolius, *DC. Syst. i, 520; Hk. f. & T. Fl. Ind. 191; F. B. I. i. 101; Brand. For. Fl 9.* Menispermum laurifolium, *Roxb. Fl. Ind. iii. 815.* Vern. *Tilphara* (Dehra Dun).

A small handsome evergreen tree. *Leaves* on short petioles, 3-6 in. long, 3-nerved, lanceolate, acute or acuminate, dark green, coriaceous, glabrous and shining. *Panicles* axillary, shorter than the leaves, solitary or 2 superposed; bracts deciduous, hairy. *Flowers* minute. *Sepals* acute. *Petals* 2-lobed. *Styles* reflexed. *Drupes* globose, minute.

Dehra Dun, in shady moist localities. DISTRIB.: Subtrop. Himalaya, from the Ravi to Nepal up to 5 or 6,000 ft.; also in Japan.

2. C. villosus, *DC. Syst i, 525; W. & A. Prod. 13; Hk. f. & T. Fl. Ind. 193: D. & G Bomb. Fl. 5; F. B. I. i. 101; Brand. For. Fl 9; Watt E. D.* Menispermum hirsutum, *Roxb. Fl. Ind. iii; 814* Vern. *Hier, Karsane* (Oudh).

A climbing undershrub. Branchlets leaves and inflor. clothed with greyish hairs. *Leaves* 2-3 in. long, petioled, ovate or ovate-oblong, occasionally 3-lobed, obtuse or mucronate, sub-cordate or truncate at the base, villous, rarely subglabrous. MALE fl. in short axillary panicles. FEM. fl. 1-3, on axillary pedicels, rarely racemed; bracts minute, linear. *Drupes* dark purple ¼ in. in diam.; endocarp annular, perforated.

Abundant throughout the area in hedges and waste places. DISTRIB.: Punjab Plain and base of Himalaya to Malabar and Pegu;

also in Trop. Africa. Fl. in Feb. and March. The juice of the ripe fruit makes a durable bluish-purple ink. The roots and leaves are used in native medicine.

3. C. Leæba, *DC. Syst. i. 529; Hk. f. & T. Fl. Ind. 192; F. B. I. i. 102; Brand. For. Fl. 13; Watt E. D.;* C. glaber, *W. & A. Prod. 13.* Vern. *Vallur.*

A climbing shrub with long slender puberulous branchlets. *Leaves* ½-1½ in. long, petioled, linear-oblong or trapezoid, entire or lobed, obtuse or mucronate, cuneate or rounded at the base, glabrous, becoming glaucous on both surfaces when old. MALE fl. many, minute, shortly pedicelled and arranged in axillary panicles. FEM. fl. solitary, on slender axillary peduncles. *Drupe* reniform, compressed, ¼ in. in diam.

Rohilkhand and Merwara, in arid places. DISTRIB.: Punjab Plain, Sindh and Karnatic; also in Afghanistan, Arabia, Trop. and subtrop. Africa. Fl. throughout the year.

5. PERICAMPYLUS, Miers; Fl. Br. Ind. i. 102.

Leaves subpeltate; petioles slender, articulate. *Flowers* in axillary cymes. *Sepals* 6, with 3 bracts; outer smaller; inner spathulate. *Petals* 6, cuneate. MALE fl.: *Stamens* 6; *filaments* cylindric; *anthers* adnate, bursting transversely. FEM. fl.: *Staminodes* 6, clavate. *Ovaries* 3; *styles* 2-partite, segments subulate. *Drupes* subglobose; endocarp horseshoe-shaped, dorsally crested or echinate; sides excavated. *Seed* curved.

P. incanus, *Miers. in Ann. & Mag. Nat Hist. Ser. II. vii. (1851) 40; Hk. f. & T. Fl. Ind 194; F. B. I. i. 102; Watt E. D.* Menispermum villosum, *Roxb. Fl. Ind. iii. 812 (not of Lamk.)*

A climbing shrub with tomentose branchlets, afterwards glabrate *Leaves* petioled, 2-4 in. in diam., suborbicular, obtuse, acute or retuse base truncate or subcordate. *Cymes* di- or trichotomous, often many and superposed: *bracts* subulate. *Sepals* villous. *Petals* acute or obtuse, margins incurved. *Drupes* red.

Rohilkhand and Oudh. DISTRIB.: Sikkim, Assam, Khasia Hills Chittagong, Malay Penins. and Malay Islands.

6. STEPHANIA, Lour.: Fl. Br. Ind. i. 102.

Climbing shrubs. *Leaves* usually peltate. *Flowers* in axillary cymose umbels. MALE fl.: *Sepals* 6-10, free, ovate or obovate. *Petals* 3-5, obovate, fleshy. *Anthers* 6, connate, encircling the top of the staminal column, bursting transversely. FEM. fl.: *Sepals* 3-5. *Petals* as in male. *Staminodes* 0.

Ovary 1; *style* 3-6-partite. *Drupe* glabrous; endocarp compressed, horseshoe-shaped, dorsally tubercled, sides hollowed and perforated. *Seed* almost annular.—Tropical portions of the Old World.

Flowers in capitate umbels	1. *S. discolor.*
Flowers in lax umbellate cymes . . .	2. *S. rotunda.*

1. S. discolor, *Spreng. Syst. iv. Cur. Post. 316.* S. hernandifolia, Walp; *Hk. f. & T. Fl. Ind. 196; F. B. I. i, 103; Watt E. D.* Cissampelos hernandifolia, *Willd.*; *Roxb. Fl. Ind. iii, 842;* C. hexandra, *Roxb. l. c. 841.* Clypea hernandifolia, *W. & A. Prod. 14.*

Leaves 3-6 in. in diam., ovate or subdeltoid, acute obtuse or acuminate, base truncate or subcordate, pale or glaucous and sometimes thinly pubescent beneath; petioles 1½-4 in. *Flowers* greenish-white, very small, nearly sessile, in small capitate umbels at the ends of axillary peduncles. *Sepals* of male fl. obovate, obtuse; of fem. fl. acute. *Petals* 3-4, much shorter. *Drupes* red.

Dehra Dun. DISTRIB.: Nepal to Chittagong, and south to Singapore, Ceylon, Malay Pen., and Malay Islands; also in Australia and Africa.

2. S. rotunda, *Lour. Fl. Cochinch. 608; Hk f. & T. Fl. Ind. 197; F. B. I. i. 103.* Cocculus Roxburghianus, *Wall.*; *W. & A. Prod. 450.* Cissampelos glabra, *Roxb. Fl. Ind. iii, 840.* Vern. *Purha* (Dehra Dun).

Roots subglobose. *Leaves* 3-7 in. in diam., broadly ovate or suborbicular, often repand or sinuate-lobed, glabrous, pale beneath; petioles 3-9 in. *Umbels* in lax cymes; peduncles of fem. fl. stouter than those of male; bracts subulate. *Flowers* ⅛-¼ in., yellow. *Sepals* narrow, cuneate, puberulous. *Petals* shorter. *Drupe* pisiform.

Dehra Dun. DISTRIB.: Trop. and temp. Himalaya, up to 7,000 ft.; Punjab; Khasia Hills; Pegu; S. India; also in Siam and Cochinchina. Roxburgh states that the acrid root is used medicinally in Sylhet.

7. CISSAMPELOS, Linn; Fl. Br. Ind. i. 103.

Suberect or twining shrubs. *Leaves* often peltate. MALE fl. cymose. *Sepals* 4, or 5-6, erose. *Petals* 4, connate, forming a 4-lobed cup. *Anthers* 4, connate, encircling the top of the stam.-column, bursting transversely. FEM. fl. racemed, crowded in the axils of leafy bracts: *Sepals* 2 (or sep. and pet. 1 each), 2-nerved, adnate to the bracts. *Staminodes* 0. *Ovary* 1; *style* short, 3-fid. *Drupe* ovoid, style-scar subbasal; endocarp horseshoe-shaped, compressed, dorsally tubercled, sides excavated. *Seed* curved; embryo slender.

C. Pareira, *Linn. Sp. Pl. 1013; Hk. f. & T. Fl. Ind. 198; D. & G. Bomb. Fl. 5; F. B. I. i. 104; Brand. For. Fl. 10, 571; Watt E. D.* C.

caapeba, *L.; Roxb. Fl. Ind. iii. 842.* C. convolvulacea, *Willd.; Roxb. l.c.; W. & A. Prod. 14.* C. obtecta, *Wall.; Royle Ill. 61.* Vern. *Dakh-nirbisi* (N.-W. Prov), *Harjewri* (Oudh), *Purhe* (Dehra Dun).

A twining shrub. *Stem* short, throwing out long herbaceous tomentose branches. *Leaves* 1-4 in., usually peltate, orbicular to reniform, more or less cordate at the base, apex obtusely mucronate. *Male cyme* long-peduncled, axillary or nearly so, many fld., hairy; *bracts* minute *Racemes of fem. fl* 1-2, axillary, with large reniform or orbicular hoary bracts. *Drupes* ½ in., subglobose, hirsute, scarlet.

Abundant throughout the area. DISTRIB.: Trop and subtrop. India from Sindh and the Punjab to Ceylon and Singapore. Cosmopolitan in warm countries. Very variable as to the shape of the leaves and in the amount of hairiness of the whole plant. The root-bark and leaves are used medicinally, and often as a substitute for the true "Pareira brava" of commerce, which is now known to be the produce of *Chondrodendron tomentosum*, Ruiz. & Pav., a native of Peru and Brazil.

V.—BERBERIDEÆ.

ERECT or climbing shrubs, or glabrous herbs. *Leaves* simple or compound with articulate segments, rarely stipulate; buds scaly. *Flowers* often globose, regular, solitary or in simple or compound racemes, usually yellow or white. *Sepals* and *petals* free, hypogynous, 2-many-seriate, usually in whorls of 3 and imbricate, caducous. *Stamens* usually 4-6, opposite the petals, free or connate; *anthers* adnate, dehiscing by slits or (in Berberis) by two ascending lids. *Carpels* 1-3, rarely more, oblong; *style* short or 0.; *stigma* dilated or conic or oblong. Ripe *carpels* usually indehiscent.—Chiefly temperate or inhabiting mountains.

To this family belongs *Podophyllum emodi*, Wall, a perennial herb occurring more or less abundantly throughout the Himalayan ranges between 6 and 14,000 ft.. The rootstock contains a valuable medicinal resin known as 'podophyllin,' which hitherto has been chiefly prepared from *P. peltatum*, the N. American representative of the genus. See *Watt E. D.*

7. BERBERIS, Linn.; Fl. Br. Ind. i. 108.

Spiny shrubs with yellow wood. *Leaves* imparipinnate or in fascicles of unifoliolate leaflets in the axils of 3-5-partite spines, often themselves reduced to spines. *Flowers* yellow, 2-sexual, in racemes or fascicles, rarely solitary. *Sepals* 6, with 2-3 appressed bracts, imbricate in 2 series. *Petals* 6, imbricate in 2 series, usually with 2 basal glands inside. *Stamens* 6, free; *anther*-cells opening by

recurved valves. *Ovary* simple. *Stigma* peltate, sessile or on a short *style*. *Ovules* few, basal, erect. *Fruit* a berry. *Seeds* few.

Leaves narrowly lanceolate or oblanceolate, not lacunose	1. *B. Lycium*.
Leaves obovate or orbicular, lacunose and strongly reticulate beneath	2. *B. asiatica*.

1. B. Lycium, *Royle Ill. 64 ; Hk. f. & T. 225 ; F. B. I. i. 110 ; Brand. For. Fl. 12 ; Watt E.D.* Vern. *Chatroi*, (Káshmal).

A rigid erect spinous shrub, 6-8 ft. high, bark white. *Leaves* 1-foliolate ; *leaflets* 1½-2½ in. long, nearly sessile, fasciculate, subpersistent, coriaceous, narrowly lanceolate or oblanceolate, mucronate, entire or spinuloes, not lacunose, bright green above, glaucous beneath and with prominent lax reticulate veins. *Flowers* small, pale yellow, on elongate racemes. *Berries* ovoid, violet. *Style* distinct. *Stigma* capitate.

Dehra Dun. DISTRIB. : W. Himalaya from Hazara to Nepal, up to 9,000 ft. usually easily recognizable, but some of its forms might be mistaken for *B. aristata*, and others resemble *B. asiatica*. Flowers in April, fruit ripens in June. An extract called 'rasaut,' prepared from the wood, is much valued medicinally in ophthalmic cases.

2. B. asiatica, *Roxb. in DC. Syst. II, 13 ; Fl. Ind. ii, 182 ; Hk. f. & T. Fl. Ind. 224 ; F.B.I. i, 110 ; Brand. For. Fl. 12 ; Watt E.D.*—Vern. *Kingora* (Dehra Dun and Garhwal).

A stout erect spinous shrub up to 6 ft. high ; bark pale. *Leaves* 1-foliolate ; *leaflets* in fascicles, 1-3 in. long, obovate or orbicular, subentire or with large distant spinescent teeth, rigidly coriaceous, whitish beneath and with strong reticulate venation, lacunose between the veins. *Flowers* in short corymbose racemes, rather small ; glands of nectary subcylindric. *Berry* large, ovoid or subglobose, red or black, glaucous. *Style* distinct. *Stigma* capitate.

Dehra Dun. DISTRIB. : Outer Himalaya from Garhwál to Bhután ; Parasnáth ; Afghanistán. Flowers Feb.-April, fruit May and June. Medicinal properties similar to those of *B. Lycium*. The berries are eaten.

VI.—NYMPHÆACEÆ.

AQUATIC perennial herbs. *Leaves* usually floating, often peltate, margins involute in vernation. *Scapes* 1-fld, naked. *Floral envelopes* all free, hypogynous or adnate to a fleshy disk that surrounds or envelops the carpels. *Sepals* 3-5. *Petals* 3-5 or many. *Stamens* many. *Carpels* 3 or more, in one whorl, free or counate or irregularly sunk in pits of the disk; *stigmas* as many as the carpels, peltate or decurrent ; *ovules* few or many, scattered

over the walls of the cells. *Fruit* formed of the connate carpels, or of separate and indehiscent carpels, or of the enlarged turbinate flat-topped disk with the nut-like carpels sunk in its crown. *Seeds* naked or arilled; albumen floury or 0; embryo inclosed in the large amniotic sac. Temperate and tropical.

Leaves floating, seeds albuminous	
Smooth herbs with white pink or red floating flowers	1. NYMPHÆA.
A prickly herb with violet-coloured partially submerged flowers . .	2. EURYALE.
Leaves and flowers raised above the surface of the water, seeds exalbuminous .	3. NELUMBIUM.

1. NYMPHÆA, Linn.; Fl. Brit. Ind. i. 114.

Large aquatic herbs. *Rootstock* creeping. *Leaves* and flowers floating. *Flowers* expanded, large, solitary, on long radical scapes. *Sepals* 4, adnate to the base of the disk. *Petals* in many series, successively transformed into stamens, all adnate to the disk. *Filaments* petaloid. *Anthers* small, linear, slits introrse. *Ovaries* many, in one series, sunk in the fleshy disk, and with it forming a many-celled ovary crowned by connate radiating stigmas; *ovules* many. *Fruit* a spongy berry, ripening under water. *Seeds* small, buried in pulp.

Leaves sharply toothed, anthers without appendages	1. *N. Lotus*..
Leaves entire or obtusely toothed, anthers with long appendages	2. *N. stellata*.

1. N. Lotus, *Linn. Sp. Pl 511; Roxb. Fl. Ind. ii, 577; Hk. f. & T. Fl. Ind. 241, D & G. Bomb.; Fl. 6; F. B. I. i, 114; Watt E. D.* Vern. *Chota kanval.* (Indian Lotus.)

Rootstock short, erect, roundish, tuberous. *Leaves* 6-12 in. across, on long cylindrical submerged petioles, sharply sinuate-toothed, downy beneath, sagittate when young. *Flowers* 2-10 in. in diam., white or pink. *Sepals* oblong, obtuse, 5-10-ribbed, glabrous or pilose externally. *Petals* oblong. *Filaments* broadly dilated at the base *Anthers* without appendages. *Fruit* 1½ in. in diam.; stigmatic rays with clubbed appendages. *Seeds* broadly ellipsoid, rough.

Common throughout the area, flowering during the rainy season. DISTRIB.: Warmer parts of India, extending to Africa, Java, and the Philippines; it also occurs in Hungary in the neighbourhood of hot springs. The tuberous underground stems are eaten and also used medicinally.

VAR. pubescens, *Hk. f. & T. l.c.* N. pubescens, *Willd.; W. & A. Prod. 17.* Leaves more densely tomentose beneath; flowers smaller, 3-4 in. in diam.; sepals acute. Distribution as of type.

2. N. stellata, *Willd. Sp. Pl ii, 1153; Roxb. Fl. Ind. ii. 579; W. & A. Prod. 17; Hk. f. & T. Fl. Ind. 243; D. & G. Bomb. Fl. 6; F. B. I. i. 114; Watt E. D.* Vern. *Bambher.*

Leaves orbicular or elliptic, quite entire or obtusely sinuate-toothed often blotched, with purple beneath. *Flowers* up to 10 in. in diam., blue, white, rose, or purple, slightly scented. *Sepals* not ribbed, often streaked with fine short purple lines *Petals* 10-30, linear-oblong or lanceolate, acute or taper-pointed. *Stamens* 10-50. *Anthers* with long appendages. *Stigmatic* rays without appendages.

Abundant within the area. DISTRIB.: Throughout the warmer parts of India; also in Africa. The rhizomes and seeds are often eaten, especially in times of scarcity.

The allusions to the 'Sacred Lotus' in ancient Hindi literature appear to refer equally to different kinds of *Nymphœa* as to *Nelumbium speciosum*. The description, however, of the "flower floating upon the waters" suggests *Nymphœa* rather than *Nelumbium*.

VAR. 1. cyanea, *Hk. f. & T. l.c.*; *F.B.I. l.c.* N. cyanea, *Roxb. Fl. Ind., ii, 577; W. & A. Prod. l.c.* Flowers medium-sized, blue, hardly scented.

VAR. 2. parviflora, *Hk. f. & T. l.c.* N. stellata, *Willd.; W. & A. Prod. l.c.* Flowers usually smaller, blue; the leaves are also smaller.

VAR. 3. versicolor, *Hk. f. & T. l.c.* N. versicolor, *Roxb., Fl. Ind. l.c.* Flowers larger, white, blue, purple or flesh-coloured; stamens very many.

2. EURYALE, Salisb.; Fl. Brit. Ind. i. 115.

A densely prickly aquatic herb; rootstock thick. *Leaves* orbicular, corrugate. *Flowers* violet-coloured, partially submerged. *Sepals* 4, erect, inserted on the edge of the torus above the carpels. *Petals* numerous, 3-5-seriate, shorter than the sepals. *Stamens* many, many-seriate, in bundles of eight; *filaments* linear. *Ovary* 8-celled, sunk in the dilated top of the torus; *stigma* discoid, depressed, concave; *ovules* few, parietal. *Berry* spongy, crowned with the persistent sepals. *Seeds* 8-20; aril pulpy; testa thick, black.

E. ferox, *Salisb. in Kon. & Sims Ann. Bot., ii, 74; Royle Ill. 65; Hk. f. & T. Fl. Ind. 245; F. B. I. i, 115; Watt E. D.* Anneslia spinosa, *Roxb. Fl. Ind., ii, 573.*

Rootstock short. *Leaves* 1-4 ft. in diam., oval or orbicular, green above, downy and red or purple beneath, with strong spiny ribs. *Flowers* 1-2 in. long, violet-coloured inside, green and shining outside. *Sepals* with recurved spines on their backs. *Petals* about 20, narrowly ovate-oblong, inner smaller. *Berry* 2-4 in. in diam., nearly round. *Seeds* about 20, from the size of a pea to that of a cherry.

Oudh, in jhils. DISTRIB.: Eastward to E. Bengal and China; also in Kashmir. It flowers during the rains. The farinaceous seeds are eaten after being roasted in hot sand.

3. NELUMBIUM, Juss.; Fl. Brit. Ind. i., 115.

Aquatic herbs with slender elongated rhizomes. Leaves and flowers raised high above the water. *Leaves* peltate. *Flowers* pink, white or yellow. *Sepals* 4-5, caducous. *Petals* and *stamens* many, hypogynous, many-seriate, caducous. *Anthers* with a club-shaped appendage. *Ovaries* many, 1-celled, sunk in the flat top of an obconic fleshy torus; *style* short, exserted; *stigma* terminal, dilated; *ovules* 1-2, pendulous. Ripe *carpels* 1-seeded, ovoid, loose in the cavities of the enlarged spongy torus; pericarp bony, smooth. *Seed* filling the carpel, without albumen. Two species are known, one found in Asia. N. Africa and Australia; the other in N. America.

N. speciosum, *Willd. Sp. Pl. 1258; Roxb. Fl. Ind. ii, 647; W. & A. Prod. 16; Royle Ill. 65; Hk. f. & T. Fl. Ind. 247.* Vern. *Kanwal* (The Sacred Lotus).

A large handsome aquatic herb with milky juice. *Rootstock* creeping, much-branched. *Peduncles* and *leaf-stalks* 3-6 ft. long, full of spiral vessels, smooth or with small scattered prickles. *Leaves* 2-3 ft. in diam., orbicular, entire, membranous, glaucous, cupped. *Flowers* solitary, 4-10 in. in diam. white or rose. *Petals* elliptic, concave. *Torus* in fruit 2-4 in. in diam.

Common in jhils and tanks, often cultivated; in flower during the hot season. DISTRIB.: Throughout India, as far north as Kashmir; also in Persia, N. Africa, Malay Islands, China, Japan, and Trop. Australia. The rhizomes, stalks, flowers and seeds are eaten, and various parts of the plant are used medicinally. This is the 'Sacred Bean' of ancient Egypt, but it no longer grows in that country. Much venerated by Hindus from very ancient times.

VII.—PAPAVERACEÆ.

ANNUAL, rarely perennial herbs, often with milky or coloured sap. *Leaves* alternate, or the upper ones rarely sub-opposite. *Stipules* 0. *Flowers* hermaphrodite, regular or irregular. *Sepals* 2 or 3, rarely 4, caducous *Petals* 4-6, rarely more, deciduous. *Stamens* indefinite or few, hypogynous, free or diadelphous; *anthers* 2, rarely 1-celled, dehiscing longitudinally. *Ovary* free, usually 1-celled and containing many ovules on parietal placentas; *stigma* simple or divided. *Fruit* a capsule opening by pores, rarely indehiscent. —Species about 200; found chiefly in the N. Temperate zone.

Eschscholtzia californica, Cham. (Californian Poppy) is frequently grown as a cold-weather annual in the plains.

Sap milky or coloured, flowers regular ; stamens indefinite, free.	
Glaucous or hispid herbs with milky sap	1. PAPAVER.
A prickly herb with yellow sap	2. ARGEMONE.
Sap watery, flowers irregular ; stamens 6, diadelphous	3. FUMARIA.

1. PAPAVER. Linn. ; Fl. Brit. Ind. i. 116.

Annual, rarely perennial herbs, with milky juice. *Leaves* lobed or cut. *Flowers* on long peduncles. *Ovary* 1-celled ; *stigma* discoid or pyramidal, with radiating lobes opposite the placentas, which project into the cell. *Capsule* short, opening by small valves under the lobes of the persistent stigma. *Seeds* small, pitted.

P. somniferum, *Linn. Sp. Pl. 508 ; Roxb. Fl. Ind. ii, 571; W. & A Prod. 17 ; Hk. f. & T. Fl. Ind. 250 ; F. B. I. i. 117 ; Field & Gard. Crops N. W. P. & Oudh, i. 64, t. XV ; Watt E. D.* Vern. *Post, afim.* (Opium Poppy.)

A glaucous annual, usually quite glabrous, rarely branched. *Leaves* oblong, amplexicaul, lobed ; lobes dentate. *Flowers* large, white, sometimes purple or scarlet. *Capsule* stalked, 1 in. in diam. globose, glabrous ; *stigmatic rays* 5-12. *Seeds* white or black.

Largely cultivated as a cold-weather crop within the area, but chiefly in the Eastern districts. Occasionally met with as an escape. The Opium Poppy, unknown as a wild plant, is now generally regarded as having originated through cultivation from a Mediterranean species, *P. setigerum*, which differs chiefly in being more or less hispid ; it also has fewer stigmas. *P. Rhœas*, Linn., *var. latifolia*, is grown as an ornamental annual in many gardens of Upper India.

2. ARGEMONE, Linn. ; Fl. Brit. Ind. i. 117.

Erect glaucous herbs with yellow juice. *Leaves* with spiny teeth. *Flowers* large, showy. *Sepals* 2 or 3. *Petals* 4-6. *Stamens* many. *Ovary* 1-celled ; *style* very short ; *stigma* 3-6-lobed ; *ovules* many, on 4-6 parietal placentas. *Capsule* prickly, dehiscing at the top by short valves. *Seeds* many.—Natives of the warmer parts of America, of which the following species has become naturalized in India.

A. mexicana. *Linn. Sp Pl. 508 ; Roxb. Fl. Ind. ii, 571 ; W. & A. Prod. 18 ; Royle Ill 66 ; Hk. f. & T. Fl. Ind. 251 ; F. B. I. i, 117 ; Watt E. D.* (Mexican or Prickly Poppy.)

A robust herb 1-2 ft. high; stem often almost woody below, simple or sparingly branched. *Leaves* 3-7 in. long, sessile, ½ amplexicaul, sinuate-pinnatifid, glaucous, white-spotted, prickly. *Flowers* 1 3 in. in diam., sessile or subsessile, yellow or rarely white. *Sepals* horned at the top and bristle-pointed. *Capsule* ¾-1½ in. long, elliptic or oblong, bristly.

A common weed on waste ground DISTRIB.: Throughout India. Introduced from America within historic times. It flowers during the cold season. The juice and the oil yielded by the seeds are used medicinally; the oil is also valued for painting purposes.

3. FUMARIA. Linn.; Fl. Brit. Ind. i. 127.

Herbs, mostly annual, usually branched, often scandent. *Leaves* finely divided; segments narrow. *Flowers* small, in terminal or leaf-opposed racemes. *Sepals* 2, small. *Petals* erect or conniving, 2 outer dissimilar; anterior flat or concave; posterior gibbous or spurred at the base; 2 inner narrow, cohering by their tips, winged or keeled at the back. *Stamens* 6, in two bundles opposite the outer petal, one filament usually spurred; central *anther* of each bundle 2-celled, lateral 1-celled. *Ovary* 1-celled; *style* slender; *stigma* entire or shortly lobed; *ovules* 2, on 2 placentas. *Fruit* indehiscent, globose, 1-seeded.

F. parviflora, *Lamk. Encycl. ii, 567*, sub.-sp. VAILLANTII, *Lois* (sp.); *F.B.I. i, 128.* F. parviflora, *Roxb. Fl. Ind. iii, 217; W. & A. Prod. 18; Royle Ill. 16; D. & G. Bomb. Fl. 7; Watt E. D.* (Fumitory).

A pale-green diffuse much-branched herb. *Leaf-segments* flat. *Racemes* 1-2 in., lax-flowered. *Flowers* ¼-⅓ in.; pedicels exceeding the bracts. *Sepals* lanceolate, much smaller than the corolla-tube. *Petals* whitish or rose-coloured with purple tips. *Fruit* globose, rugose when dry, rounded at the top and with 2 pits.

Common throughout the area as a weed of cultivation, flowering and fruiting during the cold season. DISTRIB.: Over the greater part of India, ascending to 8,000 ft. on the Himalaya; also in temp. regions of the Old World. The plant is used as a remedy for fever and ague.

IX.—CRUCIFERÆ.

HERBS, rarely undershrubs, with watery and often pungent sap. *Leaves* cauline and radical, the latter generally forming a rosette; cauline alternate, exstipulate. *Flowers* usually in corymbs or racemes. *Sepals* 4, free, imbricate, deciduous, the 2 lateral often saccate at the base. *Petals* 4, free, hypogynous, placed crosswise, imbricate, sometimes absent. *Stamens* usually 6, the 2 outer opposite the lateral sepals, 4 inner longer, in opposite pairs. *Disk* with 4 glands

opposite the sepals. *Ovary* 2-celled by a placental membrane, or 1-celled, or with superimposed cellules; *style* short and usually persistent or none. *Stigma* simple or 2-lobed; *ovules* usually many, in 1 or 2 series on the 2 parietal placentas. *Fruit* a 2-celled 2-valved pod, the valves deciduous and leaving the seeds on the placentas, or indehiscent or transversely jointed. *Seeds* small, albumen 0. *Cotyledons* large; radicle turned up on the back of one cotyledon (incumbent), or facing the edges of both (accumbent).

A large and widely distributed family, containing over 1,200 species. They are found most abundantly in the temperate and cooler regions of the N. Hemisphere. In the Polar regions and on the higher mountain ranges they often reach the limit of phænogamous vegetation; consequently very few indigenous species are met with in the plains of India, and the majority of these are annuals which flower and ripen their seeds within the period of the cold season. As a family it is easily recognized by the 4 free cruciform petals, and by the 6 stamens, 4 of which are long and 2 short (*tetradynamous*). For the correct determination of the genera, however, it is necessary to examine the internal structure of the seed. The family is also generally characterized by its antiscorbutic properties, and this fact no doubt determined the selection in very early times of the many well-known plants producing wholesome vegetables, and their gradual development and improvement under cultivation. The seeds of *Cruciferæ* contain a large quantity of fixed oil, for obtaining which certain kinds of *Brassica* such as *sarson*, *tori* and *rai*, are largely grown in India (see under *Brassica*). The following plants belonging to genera not otherwise represented in the plains of India are commonly grown for ornamental purposes:—*Ten-week Stock* (Matthiola annual), *Wallflower* (Cheiranthus Cheiri), and *Candytuft* (Iberis contracta).

Pods long or short, dehiscing throughout their length.
- Pods terete, or compressed dorsally (parallel to septum).
  - Pods narrow, long (sometimes short in *Nasturtium*), cotyledons accumbent.
    - Pods turgid, seeds in 2 rows . 1. NASTURTIUM.
    - Pods flat, valves elastic, seeds in 1 row . . . . . 2. CARDAMINE.
  - Pods short and broad, cotyledons accumbent.
    - Flowers pink, sepals erect, seeds broadly winged. A pubescent undershrub . . . . 3. FARSETIA.
    - Flowers yellow, sepals spreading, seeds not winged. A glabrous herb . . . . . 4. COCHLEARIA.
  - Pods long and narrow, compressed, not beaked; seeds in 1 row, cotyledons incumbent . . . . . 5. SISYMBRIUM.

Pods long or short, beaked; cotyledons folded longitudinally.
Flowers yellow, seeds in 1 row . 6. BRASSICA.
Flowers lilac or yellow veined with purple, seeds in 2 rows . 7. ERUCA.
Pods short, compressed laterally (at rightt angles to septum); cotyledons incumbent.
Pods many-seeded, valves not winged 8. CAPSELLA.
Pods few-seeded, valves winged 10. LEPIDIUM.
Pods long or short, indehiscent.
Pods broader than long, not beaked 9. SENEBIERA.
Pods elongate, beaked . . . 11. RAPHANUS.

1. NASTURTIUM. R. Br.; Fl. Brit. Ind. i. 133.

Terrestrial or aquatic branching herbs, glabrous or hairy. *Leaves* lobed or pinnatifid, rarely entire. *Flowers* in racemes, small, yellow or white, sometimes bracteate. *Sepals* short, spreading, equal at the base. *Petals* short, scarcely clawed, sometimes wanting. *Stamens* 6, sometimes fewer. *Pods* long or short, almost cylindrical; valves faintly 1-nerved. *Seeds* many, in 2 rows, turgid; cotyledons accumbent.

An aquatic herb with creeping stem and white flowers . . . . . 1. *N. officinale.*
Erect herbs with yellow flowers.
Lobes of leaves toothed . . . . . 2. *N. indicum.*
Lobes of leaves entire . . . . . 3. *N. montanum.*

1. N. officinale. *R. Br. in Ait. Hort. Kew, ed. II, iv, 111; Royle Ill. 70; F. B. I. i. 133; Watt E. D.* (Water-cress.)

Aquatic. *Stems* creeping and floating, much-branched. *Leaves* pinnatifid. *Flowers* white, in short racemes. *Petals* longer than the sepals; limb obovate, spreading. *Pods* ½-1 in. long, stalked, spreading or bent upwards. *Seeds* small, pitted.

Found occasionally in clear streams; common in Dehra Dun and Rohilkhand. DISTRIB.: Punjab, extending through Afghanistan to Europe. On the Himalaya it occurs frequently in a semi-wild state near hill-stations.

2. N. indicum. *DC. Syst. ii, 199; F. B. I. i. 134.* N. madagascariense, *W. & A. Prod. 19.* Sinapis divaricata, *Roxb.; Fl. Ind. iii, 123.*

An erect glabrous or more or less hairy annual. *Stem* 6-12 in., branching from near the base. Radical *leaves* deeply pinnatifid, lobes

usually toothed; upper leaves lyrate, frequently with small auricles. *Racemes* long, many-flowered. *Flowers* small, yellow. *Petals* equalling the sepals *Pods* ½-¾ in., narrow, cylindrical. *Seeds* many, small, brown, rugose.

Common in damp places. DISTRIB.: Throughout India and in Ceylon, extending to the Malay Archipel., the Philippines, China, and Japan.

3. N. montanum, *Wall. Cat. 4778 (in part); F. B. I. i. 134.* Sinapis pusilla, *Roxb. Fl. Ind. iii, 125.*

An erect branching annual, 1-1½ ft. high. *Stem* slightly villous. Radical *leaves* sinuate-pinnatifid, lobes entire. *Flowers* minute, yellow, bracteate. *Petals* equalling the sepals in length. *Pods* 1-1½ in., narrow, cylindrical. *Seeds* oblong, compressed.

Dehra Dun (Herb. Royle); N. W. Prov. (A. O. Hume). DISTRIB.: Subtrop. Himalaya from the Punjab to Sikkim, the Khasia Hills, and Burma; also in Java, China, and Japan. This resembles *N. indicum*, but is less robust, and has larger smoother less divided leaves.

2. CARDAMINE, Linn.; Fl. Brit. Ind. i. 137.

Annual or perennial often flaccid herbs, glabrous or pubescent. *Leaves* lobed or pinnate, rarely entire, with or without auricles. *Flowers* usually white or lilac. *Sepals* equal at the base. *Petals* clawed. *Pods* narrow-linear, compressed, tapering at both ends; valves with a distinct midrib, opening elastically. *Seeds* in a single row, flattened, not bordered; cotyledons accumbent.

Petioles without auricles . . .	1. *C. hirsuta.*
Petioles with sagittate auricles . .	2. *C. impatiens.*

1. C. hirsuta, *Linn Sp. Pl. 655*, VAR. sylvatica, *F. B. I. i. 138; Watt E. D.*, C. sylvatica, *Link.* (Bitter-cress.)

A glabrous annual. *Stem* suberect or decumbent, 3-12 in. long. *Petioles* not auricled. *Leaflets* stalked; those of the lower leaves orbicular-ovate, toothed; of the upper narrower and nearly sessile. *Flowers* small, white. *Petals* narrow, erect, twice as long as the very small sepals. *Stamens 6. Pods* ½ in. long, erect, obtuse.

Dehra Dun, and probably in other localities near the hills, flowering during the cold season. DISTRIB. Bengal; also throughout the temperate parts of the world.

2. C. impatiens, *Linn. Sp. Pl. 655, F. B. I. i. 138.*

An erect annual, 6-12 in. high, nearly glabrous. *Stems* 4-angular. *Petioles* of cauline leaves with sagittate auricles. *Leaflets* shortly stalked, ovate-oblong or lanceolate, more or less lobed, minutely ciliate on the margins. *Flowers* small, white *Petals* linear, erect, often wanting. *Pods* 1 in., erect, slender, acute; *style* subulate.

Dehra Dun. DISTRIB.: Himalayan ranges, up to 12,000 ft., extending through Afghanistan to Europe.

3. FARSETIA, Desv.; Fl. Brit. Ind. i. 140.

Hoary or tomentose much-branched rigid undershrubs. *Leaves* small, linear-oblong, entire. *Flowers* white pink or yellow, in spicate racemes. *Sepals* erect, connivent, lateral saccate at the base. *Petals* with long claws. *Pods* sessile, linear or elliptic-oblong, much flattened, valves convex. *Seeds* 1-2-seriate, suborbicular, broadly winged; cotyledons accumbent.

F. Hamiltonii, *Royle Ill. 71; F.B.I. i, 140; Watt E.D.* Arabis incanescens. *Munro Hort. Agrensis* 6.

Branches long, erect. *Leaves* narrowly linear. *Flowers* small. *Sepals* obtuse, strigose, with scarious margins. *Petals* obovate, a little longer than the sepals, pink. *Pods* ½-1 in. long, linear, valves almost nerveless. *Style* slender. *Seeds* in one row.

Banks of the Jumna between Delhi and Agra. DISTRIB.: Punjab, and westward to Afghanistan, Arabia and Algeria. Munro, who found it at Agra, considered it to be an introduction.

4. COCHLEARIA, Linn.; Fl. Brit. Ind. i. 145.

Glabrous, often fleshy, annual or perennial herbs. *Leaves* pinnatifid or toothed, rarely entire. *Flowers* yellow, lilac or white, in racemes, rarely solitary. *Sepals* spreading, equal at the base. *Petals* entire, shortly clawed. *Filaments* without appendages or teeth. *Pods* globose ovoid or oblong, valves turgid. *Seeds* usually 2-seriate, compressed, without wings; cotyledons accumbent.

C. Armoracia, *L.* (the common Horse-radish) is occasionally cultivated in European gardens of Upper India.

C. flava, *Buch.-Ham. ex Roxb. Hort. Beng. 48; Royle Ill. 72; F. B. I. i, 145.*

An erect, rarely depressed, diffusely branched glabrous annual, about 1 ft. in height. *Root* long, fusiform. *Leaves* 4-5 in., lanceolate, pinnatifid; lower stalked; upper smaller and auricled; lobes sinuate-toothed. *Racemes* numerous. *Flowers* small, yellow. *Pods* globose, smooth; valves without nerves. *Style* short, thick. *Seeds* many, rugose, with filiform funicles.

On river banks, and in damp places. DISTRIB.: Eastward to Bengal, and westward to the Punjab.

5. **SISYMBRIUM**, Linn.; Fl. Brit. Ind. i, 147.

Glabrous or more or less hairy or hispid annuals or perennials. *Leaves* entire or toothed. *Flowers* white yellow or purplish, in lax sometimes bracteate racemes. *Petals* with long claws. *Pods* elongate, cylindric or compressed; valves convex, 1-3 nerved, *style* short, *stigma* 2-lobed. *Seeds* 1-seriate, not margined, with filiform cords; cotyledons incumbent.

Flowers white, valves of pod 1-nerved	1. *S. Thalianum.*
Flowers yellow, valves of pod 3-nerved.	
Fruiting pedicels as broad as the pod	2. *S. orientale.*
Fruiting pedicels slender	3. *S. Irio.*

1. S. Thalianum, *J. Gay in Ann. Sc. Nat. Ser. I, vii, 399; F. B. I. i, 145.* (Thale-cress.)

An erect slender branching annual, 4-12 in. high, hispid with spreading simple or forked hairs, or glabrous. Radical *leaves* stalked, obovate, 1-3 in., entire or slightly toothed; cauline few, remote, sessile, generally entire. *Racemes* slender, elongate. *Flowers* small, white; pedicels spreading or ascending, very slender. *Pods* ½-1 in., narrow, linear, glabrous, compressed; valves convex, 1-nerved. *Style* short. *Seeds* very small, flattened; cotyledons obliquely incumbent.

A common cold-weather annual. DISTRIB.: Plains of Upper India; Himalaya, from Kashmir to Bhutan, up to 10,000 ft.; extending to Abyssinia and Europe.

2. S. orientale, *Linn. Cent. Pl. II, 24.* S. Columnæ, *Jacq*; *F. B. I. i. 150.*

A tall annual, up to 3 ft. high. *Stem* stout, erect, slightly branching, hispid with spreading or reflexed hairs, or glabrous and glaucous. *Leaves* runcinate, or sometimes entire: segments toothed, ovate-oblong to lanceolate; terminal lobe angled, of the upper leaves hastate. *Flowers* large, pale yellow. *Sepals* erect, glabrous. *Pods* 3-4 in., spreading, very slender, curved, glabrous or slightly hairy; pedicels very stout; valves 3-nerved. *Style* thick.

Dehra Dun. DISTRIB.: Kashmir to Kumaon up to 10,000 ft.; W. Tibet up to 14,000 ft.; westward to Europe.

3. S. Irio, *Linn. Sp. Pl. 659; F. B. I. i. 150; Watt E. D.* Vern. *Parjan* (Merwara). (London Rocket.)

Annual or biennial. *Stem* 1-3 ft., glabrous or slightly pubescent below. *Leaves* stalked, runcinate or pinnatifid; lobes not auricled, remote, spreading, toothed; terminal large, sometimes hastate. *Flowers* minute, yellow; pedicels slender. *Pods* 1½-2 in., overtopping the raceme when young, slender, erect, glabrous, subtorulose; valves 3-nerved; pedicels ascending, curved. *Stigma* sessile.

Merwara, in cultivated ground. DISTRIB.: Rajputana and Punjab, extending through Afghanistan to Europe and the Canary Islands.

6. **BRASSICA**, Linn. ; Fl. Brit. Ind. i. 155.

Glabrous or hispid annual biennial or perennial herbs. *Rootstock* often woody. Lower *leaves* usually pinnatifid or lyrate, the upper often entire. *Flowers* in racemes, yellow. *Sepals* erect or spreading, lateral usually saccate at the base. *Pod* elongate, cylindric or somewhat compressed, often with an indehiscent 1-seeded beak extending beyond the valves. *Seeds* globose, ovoid or flattened; *cotyledons* incumbent.

A very important genus, containing all the different varieties of cabbage and cauliflower, the colzas, rapes, turnips and mustards.*

Pods erect, nearly glabrous, appressed to the axis of the raceme	1. *B. nigra.*
Pods more or less spreading—	
Pods hairy, shorter than the flat beak	2. *B. alba.*
Pods smooth, longer than the slender conical beak—	
Stem-leaves tapering to the base, not amplexicaul.	
Stems not elongating in early growth; leaves green, those at the base persisting to form a loose cabbage, cauline leaves not lyrately lobed	3. *B. rugosa.*
Stems elongating from the commencement of growth; basal leaves quickly withering, those of the stem mostly lyrately lobed .	4. *B. juncea.*
Stem-leaves broad-based, the upper ones amplexicaul.	
Leaves hairy when young, glaucous on both surfaces; pods usually stout	5. *B. campestris. var. Sarson.*

* For a clear understanding of the various cultivated forms of each of the above-mentioned groups as affecting the relation to them of the different kinds of mustard cultivated in Upper India, the reader is referred to Dr. Prain's exhaustive report on the cultivated mustards of Bengal, published in Bulletin No. 4 (1898) of the Department of Land Records and Agriculture, Bengal.